EURO PM2024 CONGRESS & EXHIBITION

Technical Programme Committee
8th of February 2024

ABSTRACTS BOOK

GROUP 3 - MATERIALS

EPMA
european powder metallurgy association

EURO PM2024 CONGRESS & EXHIBITION

Technical Programme Committee
8th of February 2024

MATERIALS

FUNCTIONAL MATERIALS

EPMA
european powder metallurgy association

EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M48
ID : 6277035

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Functional Materials

Author : Dr Wimbert Lars (GKN Powder Metallurgy Engineering GmbH, Germany)

Co-author(s) : Mr Lindenau René (GKN Powder Metallurgy Engineering GmbH, Germany); Mrs Neumann Bettina (GKN Powder Metallurgy Engineering GmbH, Germany); Mr Schnaider Edwin (GKN Powder Metallurgy Engineering GmbH, Germany)

Title : Optimizing The Production Process Of NdFeB Magnets

Keyword(s) :
Permanent Magnets, Rare Earth Magnets, NdFeB

Abstract :
Permanent magnets and especially NdFeB (Neodymium Iron Boron) magnets are one of the most critical components in the global manufacture of modern electric motors. The production process of NdFeB magnets contains a large number of different procedures, all of which can have an influence on the properties of the end product. Although at first glance relatively similar to the classic PM process, the manufacturing route involves some special challenges that will be examined in more detail in this paper. Starting with the optimization of the hydrogen decrepitation of the base material this contribution will additionally describe the effect of different milling parameters on microstructure and magnetic properties, the procedure of dimensionally precise compaction and sintering of magnet preforms and the magnetic testing of finished magnets.

Innovative Aspect(s) :
The manufacturing process of NdFeB permanent magnets is a complex multi-step production route in which every step from melting to final heat treatment can have an impact on the final magnetic properties. The paper will provide an overview over the manufacturing process and will focus on some powder related process steps to explain the effects of different process parameters on the final magnet properties.

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

Poster ☐ Poster & Reserve Oral ☐

Withdraw ☐ Reason : .....

Notes to author : .....

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M49
ID : 6281383

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Functional Materials

Author : Mr Sota Muñoz Ángel (CEIT-BRTA, Spain)

Co-author(s) : Dr Burgos Nerea (CEIT-BRTA, Spain); Dr Martín Jose Manuel (CEIT-BRTA, Spain); Dr Zhukova Valentina (UPV|EHU, Spain); Dr Gonzalez Julián (UPV|EHU, Spain); Mr Ipatov Mihail (UPV|EHU, Spain); Mr Osinalde Mikel (ELESA, Spain)

Title : Maximization Of Magnetic Saturation And Permeability Of Amorphous Powder Cores

Keyword(s) :
Amorphous, Soft Magnetic Material, SMC, Core Loss, Density, High Pressure

Abstract :
This work focuses on the study of increasing magnetic properties of soft magnetic composites (SMCs) made of amorphous powder. Amorphous powder was produced by gas atomization and SMCs were made by coating particles with an epoxy resin and cold pressed. However, the use of a coating isolating each particle, together with the brittleness of the amorphous powder, leads to low density compacts, which reduces the saturation magnetization and permeability. To increase compact density, a bimodal mixture of particle size fractions at a specific volume percent that maximizes particles packing was used. Additionally, powder cores were consolidated under high pressures (1, 1.5 and 2 GPa) to maximize density. Nevertheless, high pressure induces large residual stresses which reduces soft magnetic properties and increases power losses. Residual stresses were reduced by subsequent annealing. Thus, magnetic properties and power losses were analysed as a function of pressure, particle size fraction, resin content and annealing.

Innovative Aspect(s) :
SMCs are growing in the market for electrical devices such as inductors and transformers due to their isotropic 3D-properties, high electrical resistivities and the possibility of produce complex shapes. These properties make SMCs a promising candidate to replace existing electrical steels and ferrites for medium and high frequency applications respectively. In addition, amorphous materials provide very soft magnetic properties due to the absence of a crystal lattice and a high electrical resistivity that reduce Eddy currents. However, amorphous SMCs have some drawbacks such as low compact density, magnetic saturation and permeability. In this work, new amorphous SMCs were produced by mixing two fraction of particle sizes and consolidated under high pressure (up to 2 GPa). In addition, it is studied magnetic properties and power losses of SMCs in function of the resin content, the compaction pressure, particle size fraction and stress relief.

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

Poster ☐ Poster & Reserve Oral ☐

Withdraw ☐ Reason : .....

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M50
ID : 6281350

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Functional Materials

Author : Dr Cano Cano Santiago (Incus GmbH, Austria)

Co-author(s) : Mr Peritsch Paul (Incus GmbH, Austria); Dipl-Ing Bosters Johannes (Incus GmbH, Austria); Mr Anand Atul (Vienna University of Technology, Austria); Prof Dr Gierl-Mayer Christian (Vienna University of Technology, Austria); Dr Harakály György (Incus GmbH, Austria)

Title : Recent Advances Of Lithography-based Metal Manufacturing Of Copper

Keyword(s) :
Additive Manufacturing, Copper, Lithography-based Metal Manufacturing, Sinter-based Additive Manufacturing, Powder, Particle Size Distribution

Abstract :
The high thermal and electrical conductivity properties of copper positions it as the optimal choice for a diverse range of electronic, electrical, and energy components. In applications like thermal management, incorporating small and intricate copper structures enhances component efficiency due to an increased surface area. Lithography-based metal manufacturing (LMM) facilitates the production of such geometries in a flexible and scalable manner, thereby unlocking the potential for innovative commercial copper products. Nevertheless, several challenges need to be addressed to manufacture high-quality copper components, ranging from the selection of suitable materials to ensuring stability during production and developing optimal processing parameters. This study focuses on evaluating the feedstock properties and processability of copper powders from different sources using LMM. Finally, the properties of the sintered components are measured to assess their effectiveness in thermal and electrical management applications.

Innovative Aspect(s) :
As indicated in the abstract, lithography-based metal manufacturing (LMM) can unlock the production of several geometries not attainable until now; those geometries, combined with the high thermal and electrical conductivity of copper, can lead to components with much higher efficiency in sectors like electronics or transportation. Despite initial studies have evaluated the LMM of copper, many aspects need to be investigated before the production of high-quality components. Our study explores the LMM of copper powders from different providers, with different particle size distributions and quality. By evaluating effect of the powder on the feedstock properties, the processability by LMM and the final properties of the components, we provide the powder metallurgy community a reference for the powder selection for LMM and other sinter-based additive manufacturing processes. Moreover, preliminary designs will be presented to demonstrate the potential of copper LMM.

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

Poster ☐ Poster & Reserve Oral ☐

Withdraw ☐ Reason : .....

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M136
ID : 6283286

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Functional Materials

Author : Mr Eida Masaaki (Sumitomo Electric Sintered Alloy, Ltd., Japan)

Co-author(s) : Mr Hirao Yuki (Sumitomo Electric Sintered Alloy, Ltd., Japan); Dr Ing Saitou Tatsuya (Sumitomo Electric Sintered Alloy, Ltd., Japan); Dr Ing Ueno Tomoyuki (Sumitomo Electric Sintered Alloy, Ltd., Japan)

Title : Enhanced Functionality Of Soft Magnetic Composite Cores For Axial Flux Motors By Insulating Coating Technology

Keyword(s) :
Soft Magnetic Composite Core, Axial Flux Motor, Insulation Coating, High Heat Dissipation Property

Abstract :
The advancement of electric mobility as well as improvement in the efficiency of home appliances and industrial equipment have led to a need for higher performance motors. Axial flux motors (AFM) are attracting attention as a motor that meets the need because of their thin structure and high torque compared to radial flux motors. In order to realize these AFMs, magnetic cores that are suitable for the three-dimensional magnetic circuit are essential. So, we are developing soft magnetic composite cores (SMC) for AFMs with their magnetic isotropic properties and high design flexibility in shape. In this study, for ensuring insulation resistance between the SMC and the copper winding, we have developed insulate-coated SMC applies a resin coating to the core surface that has high dielectric strength and heat dissipation properties despite being thin, several tens of micrometers thick.

Innovative Aspect(s) :

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

Poster ☐ Poster & Reserve Oral ☐

Withdraw ☐ Reason : .....

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M172
ID : 6282843

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Functional Materials

Author : Dr Ing Fortini Annalisa (University of Ferrara, Italy)

Co-author(s) : Dr Ing Suman Alessio (University of Ferrara, Italy); Ms Vezzani Ottavia (University of Ferrara, Italy)

Title : Tribological Behavior Of Soft Magnetic Composite Materials In Lubricated Condition

Keyword(s) :

Abstract :
Soft magnetic composites (SMCs) have gained prominence for compact and powerful electromechanical systems, combining metallic functionality with the ability to generate a magnetic field autonomously. These materials, capable of generating a magnetic field without external supply, find applications in automotive and aerospace technologies to enhance power and withstand mechanical stress, reducing component count, size, and system weight. This study delves into the tribological behaviors of two SMC variants produced through powder metallurgy. Employing a tribometer in lubricated conditions per the ASTM G-99 standard, wear tests scrutinize the impact of oil temperature and applied load. Post-mortem analysis identifies the influence of oil viscosity on SMC operational life, with removal mechanisms contingent on load conditions. This research underscores the importance of judiciously selecting oil characteristics and load parameters to bolster SMC reliability and diminish maintenance requirements.

Innovative Aspect(s) :

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

Poster ☐ Poster & Reserve Oral ☐

Withdraw ☐ Reason : .....

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M165
ID : 6279398

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Functional Materials

Author : Dipl-Ing Thamm Merlin (Fraunhofer Institute for Manufacturing Technology and Advanced Materials, Germany)

Co-author(s) : Dr Ing Lindemann-Geipel Inge (Fraunhofer Institute for Manufacturing Technology and Advanced Materials, Germany); Dipl-Ing Höhnel Christoph (TUD Dresden, Germany); Mr Wang Shufan (RWTH Aachen (IAPK), Germany); Mr Deng Yuanbin (RWTH Aachen (IAPK), Germany); Prof Dr Broeckmann Christoph (RWTH Aachen (IAPK), Germany); Dipl-Ing Wentzlik Thomas (Magnetec GmbH, Germany); Mr Trupp Tobias (Magnetec GmbH, Germany); Prof Dr Weißgärber Thomas (Fraunhofer Institute for Manufacturing Technology and Advanced Materials, Germany)

Title : Analysis Of A Powder Metallurgical Production Route For Nanocrystalline Soft Magnetic Components

Keyword(s) :
Powder Compaction, FAST|SPS, Soft Magnetic Materials, Nanocrystalline

Abstract :
The prominent nanocrystalline alloy Fe73.6Si15.5B6.9Cu1.0Nb3.0 (at.%) is characterized by superior soft magnetic properties such as extremely low magnetic losses. The ribbons produced by melt spinning are conventionally difficult to process and thus are only wounded into toroidal cores. To avoid damage of the brittle nanocrystalline ribbons, a protective housing is needed, which limits the operating temperature of the wounded toroids to about 200 °C. In the publicly funded NanoKompakt project, both issues are addressed by manufacturing nanocrystalline components via a powder metallurgical process route using FAST|SPS to compact powder into discs, toroids and E-cores. Achieving a homogeneous temperature distribution during the FAST|SPS process is a great challenge due to the low conductance of the powder and a narrow temperature range for compaction. Therefore, simulation of the temperature distribution during FAST|SPS is needed. Both, process parameters, e.g. pressure and temperature, and material properties of powder and tooling are taken into account.

Innovative Aspect(s) :
The article describes a new fabrication process for processing nanocrystalline soft magnets using FAST|SPS. Large powder flakes are used to achieve significantly higher permeabilities (up to 20,000) than is usual with powder cores. These powders only apply a low transverse pressure to the pressing tool, so that it can be designed with very thin walls. This improves the temperature distribution during compaction with FAST|SPS.The temperature range during compaction to achieve excellent soft magnetic properties is very small, so the temperature distribution in the pressing tool is simulated based on the thermal and electrical properties of the used materials. Based on the simulation, new pressing tools are designed to produce larger and complex shaped components.The process has also already been applied to new types of nanocrystalline soft magnetic alloys with high power density. These require a high heating rate during crystallisation in order to prevent grain growth.

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M352
ID : 6284004

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Functional Materials

Author : Mr Mohan Vignesh (Technische Universitaet Wien, Austria)

Co-author(s) : Prof Dr Gierl-Mayer Christian (Technische Universitaet Wien, Austria); Dr Rauchenwald Elisabeth HUAWEI TECHNOLOGIES AUSTRIA GMBH, Austria)

Title : Oxidation In Fe-based SMC Powders

Keyword(s) :
Functional Materials, Ferrous materials, Energy, Tooling

Abstract :
Soft Magnetic Composites (SMCs) are a class of ferromagnetic materials used for various applications. At high frequencies, eddy current losses contribute significantly to hysteresis losses. To limit these, the electrical conductivity of the material must be reduced by alloying and the conduction pathways within compacted parts must be avoided. An effective way to accomplish the latter is to create an oxide layer on the powders. However, it is more difficult to oxidize pre-alloyed powders. In this paper, a few approaches have been attempted with different levels of success. In each approach, oxygen content after each approach was measured as our main output parameter. In addition to this, powder surfaces were examined using SEM images to have a closer view of how the oxidation methods affected the particles. This study aims to better understand the feasibility of oxidation as a coating mechanism for high-frequency applications.

Innovative Aspect(s) :
Soft Magnetic Composites are ferromagnetic materials combined with organic or inorganic materials to enhance their effectiveness. In this work, three Fe-based alloys (FeSi, FeSiAl & FeNi) will be discussed as interesting materials for potential high-frequency applications. Their operability in these conditions depends on low eddy current losses. As a result, it is imperative to reduce conduction pathways (metal-metal connections) within produced parts. While various organic and inorganic coatings are available, oxide coatings are the simplest option. Pre-alloyed powders offer more uniform and homogenous properties than mechanically alloyed powder mixes. However, certain alloying elements also increase oxidation resistance. Therefore, we attempt a few oxidation techniques to identify one that gives us significant oxidation on our powders. Process effectiveness and reproducibility outside a laboratory setting are also considered while selecting oxidation methods. This is an important step for further expansive work in this project and for future SMC parts.

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M353
ID : 6284012

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Functional Materials

Author : Mr Mohan Vignesh (Technische Universitaet Wien, Austria)

Co-author(s) : Mr Venclik Bastian (Technische Universitaet Wien, Austria); Dr Rauchenwald Elisabeth HUAWEI TECHNOLOGIES AUSTRIA GMBH, Austria); Prof Dr Gierl-Mayer Christian (Technische Universitaet Wien, Austria)

Title : Densification Behavior Of Fe-based SMC Materials And Their Magnetic Performance

Keyword(s) :
Functional Materials, Ferrous materials, Energy, Tooling

Abstract :
Soft Magnetic Composites (SMCs) have various applications due to their properties such as high magnetic permeability, low coercivity, etc. From the literature, we know that densification greatly improves these properties. Conversely, there are risks such as springback and delamination. In this work, densification attempts of three Fe-based SMC powder cores (FeSi, FeSiAl & FeNi) are discussed and the influence of different factors (composition, binder content & compaction pressure) is shown. After successful parts production, hysteresis tests were performed and data from some compacted powder cores are discussed. Results show that each material responds differently to compaction, as expected. However, this is not always reflected in magnetic properties. Similarly, we also study the influence of adding additional iron to FeSi powder for sample stability and magnetic testing up to a range of 100 kHz to ascertain the potential benefits and considerations we must keep in mind.

Innovative Aspect(s) :
Soft Magnetic Composites are ferromagnetic materials combined with organic or inorganic materials to enhance their effectiveness. In this work, three Fe-based alloys (FeSi, FeSiAl & FeNi) are discussed. These powders are mixed with binders, compacted and subject to de-binding before further characterization such as density measurement and magnetic testing. To exploit their potential electrical properties better in the future, we must maximize their magnetic performance now. Hence, maximum compaction is imperative. This is tricky for powder cores due to spring-back. Since the final components are intended to serve at frequencies around 100 kHz, understanding their performance is critical. In such a multifaceted discussion, there are also benefits to adding additional iron powder despite their well-documented disadvantages. This will also be studied in this examination. This article discusses the various responses exhibited by the metal powders mentioned above and paves the way for further work.

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M354
ID : 6319979

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Functional Materials

Author : Dr Ing Schneider Markus (GKN Powder Metallurgy Engineering GmbH, Germany)

Co-author(s) :

Title : The Size Effect Of The Strength Of Sintered Nd2Fe14B Hard Magnets

Keyword(s) :

Abstract :
Ceramics and intermetallic compounds, e.g. sintered Nd2Fe14B hard magnets, are hard and brittle. The lack of any macroscopic plasticity yields to the fact that all defects exhibit its sharpest effect as predicted with the methods of the classical Linear Elastic Fracture Mechanics and Neuber's theory of notch stresses. Residual stresses from the processing do not relax. The lack of any peak stress or stress intensity reducing plasticity explains its stronger scattering and probability density function's loss of symmetry. The probability density functions of common ceramics are skewed and broader which leads to the need to consider the whole probability density function and to define local component strength values. This refers to Weibull's "weakest link theory". Two different Nd2Fe14B hard magnet grades were tested and corresponding characteristic strength values and Weibull moduli were derived. The Weibull moduli can be used to predict the size effect of the strength.

Innovative Aspect(s) :

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M355
ID : 6319981

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Functional Materials

Author : Dr Ing Schneider Markus (GKN Powder Metallurgy Engineering GmbH, Germany)

Co-author(s) :

Title : Fracture Toughness And Grindability Of Sintered Nd2Fe14B Hard Magnets

Keyword(s) :

Abstract :
The critical grain depth of cut is a grinding metric which controls the transition from a ductile grinding regime to a brittle grinding regime and it can be correlated with several material parameters. A ductile grinding regime is preferred because it does not damage the bulk material. Intermetallic compounds, e.g. sintered Nd2Fe14B hard magnets, are very brittle and therefore prone for chipping defects. The fracture toughness is a relevant factor – with a quadratic effect – in the equation of the critical grain depth of cut and controls the required grinding process parameters. Anyhow, the conventional plane-strain fracture toughness derivation method with chevron notched 3-point bending specimens is very expensive due to the needed electro discharge machining procedure to wire erode the chevron-shaped notch. As an alternative the indentation based Palmqvist toughness method was applied with good results. The derived fracture toughness values are very low but in a reasonable

Innovative Aspect(s) :

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EURO PM2024

CONGRESS & EXHIBITION

Technical Programme Committee

8th of February 2024

MATERIALS

LIGHT MATERIALS

EPMA

european powder metallurgy association

EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M52
ID : 6274677

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Light Materials

Author : Dr Kairet Thomas (Sirris, Belgium)

Co-author(s) : Dr Hemberg Axel (Materia Nova, Belgium); Prof Godet Stéphane (Université Libre de Bruxelles, Belgium); Dr Malet Loïc (Université Libre de Bruxelles, Belgium)

Title : L-PBF Printing Of 7075 Aluminium Powder Modified Using A Pure Ti PVD Coating : In-situ Micro-alloying

Keyword(s) :
Aluminium 7075, L-PBF, PVD Coating, Modified Powder

Abstract :
7075 aluminium alloys are common in the aerospace industry and are impossible to print on L-PBF due to there hot cracking sensitivity. The approach in this paper shall be to use the Ti PVD coating to add in the grain refiner in the meltpool and the microstructure shall be investigate in terms of mechanical properties, presence of defects, the impact of standard heat treatment. SEM investigations, Optical microscopy and tensile testing shall be used to show how the coating affects the solidification process. The impact of the coating shall have an impact on powder dynamics and rheological behaviour.

Innovative Aspect(s) :
Most strategies to print 7075 imply add in a grain refiner as a powder with issue of spreadability and homogeneity with the bulk base alloy. The use of PVD coatings on the powder overcome the issues of spreadability and homogeneity.

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M53
ID : 6278391

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Light Materials

Author : Dipl-Ing Staufer Ella (RHP Technology, Austria)

Co-author(s) : Prof Dr Edtmaier Christian (TU Wien, Austria); Dr Horky Jelena (RHP Technology, Austria); Dr Klein Thomas (Light Metals Technologies, Austria); Dr Zhang Duyao (RMIT, Australia); Prof Dr Easton Mark (RMIT, Australia); Dr Schmitz-Niederau Martin (voestalpine Böhler Welding Germany, Germany); Miss Ballok Elisabeth (TU Wien, Austria)

Title : Development Of High Strength Ti-Cu Based Alloys With Equiaxed Grain Growth Produced Via Plasma Metal Deposition For Aerospace Applications

Keyword(s) :
Titanium Alloys, Material Characterisation, Mechanical Properties, Additive Manufacturing

Abstract :
The growing demand for titanium alloys, particularly in the aerospace industry, arises from their remarkable strength-to-weight ratio. However, the commonly used Ti-6Al-4V (Ti64) alloy exhibits columnar grain growth after additive manufacturing (AM), such as powder bed fusion (PBF) or direct energy deposition (DED), resulting in anisotropic mechanical properties. To overcome this, Ti-Cu-based alloys were introduced for equiaxed grain growth, but their mechanical properties fell short of Ti64. Ternary and quaternary alloying elements (Fe and Cr) were incorporated to enhance mechanical properties. Firstly, several alloys (Ti-6.5Cu-xCr-yFe) produced via powder hot-extrusion exhibited promising microstructure under light microscopy and SEM. Hardness and tensile strength were improved, even exceeding the tensile strength of Ti64. The most promising ones underwent the blown-powder Plasma Metal Deposition process (PMD) for in-situ alloying, revealing fine microstructures, equiaxed grains, and increased tensile strength. These findings highlight their potential for aerospace applications, presenting enhanced isotropic mechanical properties

Innovative Aspect(s) :
As additively manufactured Ti-parts are not available for thermomechanical heat treatments, it is important to produce equiaxed grain growth right after additive manufacturing in order to receive isotropic properties. The main goal of this work was to develop a Ti-based alloy with isotropic properties and mechanical properties matching the ones of the standard alloy Ti-6Al-4V. The results show that two alloys result in equiaxed grain growth after a blown-powder Plasma-Metal-Deposition process and exceed the mechanical properties of Ti-6Al-4V. With these new alloys, the material yield of titanium alloys can be increased as the material consumption can be reduced in comparison to traditional forging methods.

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M54
ID : 6278385

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Light Materials

Author : Dr Ing Chouket Ameur (MINES Paris, PSL* Research University - CEMEF, France)

Co-author(s) : Prof Lahouij Iméne (MINES Paris, PSL* Research University - CEMEF, France); Dr Chmielowski Radoslaw (IMRA Europe S.A.S., France); Dipl-Ing Delatouche Bruno (IMRA Europe S.A.S., France); Dr Ing Pradille Christophe (MINES Paris, PSL* Research University - CEMEF, France); Prof Montmitonnet Pierre (MINES Paris, PSL* Research University - CEMEF, France)

Title : Tribo-mechanical Performances Of Ti3C2Tx MXene Flakes Reinforced Magnesium Alloy Composites

Keyword(s) :
Mg alloy Matrix Composite, MXene Flakes, 2D Materials, Mechanical Properties, Spak Plasma Sintering

Abstract :
MXenes a novel class of 2D metal carbides and nitrides, have emerged as promising materials for reinforcing lightweight alloys owing to their excellent mechanical properties. The efficiency of MXene in enhancing the mechanical strength of metallic composites is influenced by the employed manufacturing methods and their ability to design highly dense and uniform composites. In this study, we utilised the spark plasma sintering process to fabricate AZ91 composites reinforced with Ti3C2Tx MXene flakes. Achieving a uniform dispersion of the powder was a key objective, ensuring that MXene particles completely coat the AZ91 powder grains. The interface bonding of the two phases of the manufactured samples was then analysed through FIB cross-sectioning for different set of MXene fractions. The effect of Ti3C2Tx incorporation on the mechanical strength, ductility and failure mechanisms of the composites was assessed through uniaxial compression tests. The tribological properties were investigated via in situ SEM scratch experiments.

Innovative Aspect(s) :

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M55
ID : 6278426

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Light Materials

Author : Dr Ing Rommel Daniel (GE Additive, Germany)

Co-author(s) : Dr Ing Schunk Christopher (GE Additive, Germany); Mr Wielenberg Christoph (Premium AEROTEC, Germany); Mr Palm Frank (Airbus, Germany)

Title : Investigation Of High-Productivity Parameter Sets For L-PBF Of Next Generation Al-Sc-Alloy

Keyword(s) :
High-Strength Aluminum, L-PBF, Al-Sc-Alloy

Abstract :
A next generation Al-Sc-alloy (Scancromal® (Al-Cr-Sc-Zr)) was printed using L-PBF technology. Compared to the more familiar Scalmalloy® (Al-Mg-Sc-Zr-Mn) the new material concept Scancromal® offers several advantages regarding process stability. Focus of the investigation was to explore the potential of such tailored alloy regarding maximum productivity utilizing increased layer thickness and laser power.Processing windows for two build layer thicknesses: 50 and 100 µm and two laser powers: 370 and 740 W were explored in order to identify parameter combinations to create dense (high strength & ductile) material and at the same time achieving highest build rates. The most promising combinations were down selected to print additional samples for microstructural and mechanical characterization. Samples were analyzed in "as printed" and heat-treated states to enable conclusions regarding processing parameters and resulting microstructure in addition to mechanical properties. Therefore, tensile properties were evaluated at room and elevated temperature.

Innovative Aspect(s) :

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Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M56
ID : 6281344

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Light Materials

Author : Prof Dr Bengtsson Sven (Höganäs AB, Sweden)

Co-author(s) : Dr Riabov Dmitri (Höganäs AB, Sweden)

Title : Optimized Heat Treatment Process Of Al-Mn-Cr-Zr Alloys Printed By Powder Bed Fusion - Laser Beam

Keyword(s) :
PBF-LB, Al-Mn-Cr-Zr Alloy, Heat Treatment, Mechanical Testing, Ductility

Abstract :
Additive manufacturing by powder bed fusion – laser beam process can produce parts with complex geometry and good mechanical strength. However, most conventional alloys with higher strength are not very well suited for the AM process, which has led to the development of new alloy systems. The newly developed Al-Mn-Cr-Zr alloy requires an aging process step after printing where several types of precipitates are formed. This is the main contributor to the strength of this alloy system. Ultimate tensile strength and Yield Strength reach good levels while ductility is on the low side compared to wrought materials in the same performance regime. In the present work tensile test bars were aged at 375 oC for different lengths of time. The response in terms of tensile test data, fracture surface appearance and microstructure are discussed in the paper.

Innovative Aspect(s) :
The major innovative aspect is trying to optimize the heat treatment to improve ductility instead of hardness | UTS. Also an innovative aspect is trying to modify the print procerss to ensure that a microstructure is formed that does not limit the ductility.

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

Poster ☐ Poster & Reserve Oral ☐

Withdraw ☐ Reason : .....

Notes to author : .....

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M57
ID : 6282466

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Light Materials

Author : Ms Goettgens Valerie (University of Innsbruck, Austria)

Co-author(s) : Prof Dr Leichtfried Gerhard (University of Innsbruck, Austria)

Title : Influence Of Oxygen Scavenging On Mechanical And Microstructural Properties Of Additively Manufactured Titanium By The Addition Of Lanthanum Hexaboride

Keyword(s) :
Titanium Alloys, Laser Powder Bed Fusion, Additive Manufacturing, Alloy Development

Abstract :
In this work, commercially pure Ti was in situ alloyed in LPBF with 1 and 3 wt% LaB6 and TiB2, respectively, to study their influence on mechanical and microstructural properties. In samples where LaB6 was added an oxygen scavenging effect, associated with the precipitation of La2O3, and TiB formation was observed. In the case of TiB2 addition, TiB precipitates were found. Compared to TiB2, a lower hardness was observed in samples with LaB6. When 1 wt% LaB6 was added, the material showed a lower UTS than samples containing 1 wt% TiB2, but a similar elongation. The addition of 3 wt% LaB6 resulted in a decrease in UTS but an increase in elongation compared to 3 wt% TiB2.

Innovative Aspect(s) :
In titanium, interstitial oxygen increases the strength but reduces the elongation. If present in excessive amounts, it causes severe embrittlement. In LPFF, depending on the process atmosphere, the oxygen uptake in titanium can be tremendously increased due to the process characteristics. With the increase in interstitial oxygen in addition to embrittling martensite formation typically occurring in LPBF, producing crack-free parts with balanced tensile properties can be even more challenging. With the oxygen scavenging effect of lanthanum, excessive oxygen can be removed from interstitials during the process, associated with the formation of La2O3. Using this effect, a higher oxygen concentration in the process atmosphere in LPBF can potentially be tolerated, resulting in time and monetary savings.

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

Poster ☐ Poster & Reserve Oral ☐

Withdraw ☐ Reason : .....

Notes to author : .....

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M58
ID : 6281373

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Light Materials

Author : Dr Moser Mathias (ICB UMR 6303 CNRS | uB, France)

Co-author(s) : Dr Ing Ariane Mostapha (Sintermat, France); Mr Buisson Laurent (SATT Sayens, France); Mr Augustin Rémi (Safran Tech, France); Mr Sallot Pierre (Safran Tech, France); Prof Dr Bernard Frédéric (ICB UMR 633 CNRS | uB, France)

Title : Study Of The Change In Scale For The Sintering Of An Aluminium Alloy Powder By Spark Plasma Sintering

Keyword(s) :
Aluminum Alloy, Scale-up, SPS

Abstract :
Spark Plasma Sintering (SPS) technology is widely used to develop emerging materials with a fine and controlled microstructure. The main challenge for an industrial development of the process is to master the scale-up. From an SPS perspective, this requires suitable graphite tooling and a sintering cycle that can be applied to large-sized parts. Samples with diameters of 60 mm and heights of 10 mm were sintered from an aluminium alloy powder in order to reach an optimal densification and microstructure. Then, samples with diameters of 170 mm and heights of 15 mm were sintered. Characterisations and numerical simulation analyses were performed to determine the effects of the scale-up and to optimize the sintering conditions for obtaining dense and homogeneous materials

Innovative Aspect(s) :

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

Poster ☐ Poster & Reserve Oral ☐

Withdraw ☐ Reason : .....

Notes to author : .....

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M126
ID : 6278515

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Light Materials

Author : Dr Ing Seeliger Hans-Wolfgang (Gränges Powder Metallurgy, Germany)

Co-author(s) : Dr Neu Tillmann (Institute for Applied Materials, Helmholtz Zentrum Berlin for Materials and Energy, Germany); Dr Garcia-Moreno Francisco (Institute for Applied Materials, Helmholtz Zentrum Berlin for Materials and Energy, Germany); Dr Kamm Paul (Institute for Applied Materials, Helmholtz Zentrum Berlin for Materials and Energy, Germany)

Title : Aluminium Scandium Powder Alloy Development For Hydrogen Storage Valve

Keyword(s) :
Aluminium Scandium Alloy Powder, Additive Manufacturing, Save Scandium Source, Hydrogen Storage Valve, Spray Forming

Abstract :
Scandium additions of typically up to 0.2 wt% in wrought Al alloys are known to improve their mechanical performance. New sources and process routes for scandium extraction are now being identified and developed. Laser bed powder fusion (LBPF) process is characterized by a rapid solidification, which improves microstructure. The rapid solidification allows for a fine distribution of Sc precipitates. For the production of a hydrogen on-tank valve, various Al alloy with up to 1 wt% Sc and Zr additions were mixed. For that purpose, powder from an of AlSc2 (in wt%) master alloy purchased from Rio Tinto (Canada) was produced and mixed with other elemental and alloy powders to obtain the desired composition. With different compositions parts were produced by LBPF, characterized with optical microscopy, hardness measurements. Their mechanical parameter were evaluated and the results were compared with the state-of-the-art AlSi10Mg alloy.

Innovative Aspect(s) :
First aluminium hydrogen valve from additive manufacturing, New scandium source, Sustainable manufacturing, More secure scandium supply chain, Improved scandium alloy in terms of hydrogen absorption, Optimized processing of components through special tool coating, Materials are manufactured by spray forming, which results in both powder and solid material with a very fine structure in one manufacturing process

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

Poster ☐ Poster & Reserve Oral ☐

Withdraw ☐ Reason : .....

Notes to author : .....

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : P-M60
ID : 6278611

Requested presentation type : Poster Presentation

Topic : Materials **Subtopic :** Light Materials

Author : Dr Ing Chouket Ameur (MINES Paris, PSL* Research University - CEMEF, France)

Co-author(s) : Prof Montmitonnet Pierre (MINES Paris, PSL* Research University - CEMEF, France); Ing Frances Krystal (IMRA Europe S.A.S., France); Dr Ing Pradille Christophe (MINES Paris, PSL* Research University - CEMEF, France); Dr Chmielowski Radoslaw (IMRA Europe S.A.S., France); Prof Lahouij Iméne (MINES Paris, PSL* Research University - CEMEF, France)

Title : Investigation Of Microstructures And Mechanical Properties Of AZ91 Magnesium Alloy Reinforced By Layered Ti3AlC2 MAX Phase

Keyword(s) :
Mg alloy Matrix Composite, MAX Phase, SPS, Microstructure, CompressionTests

Abstract :
Magnesium and its alloys seem to be the most promising and next generation material in transportation sector due to its high specific strength, good castability and low density. In this study, magnesium alloy (AZ91) metal matrix composites (MMCs) reinforced with 0-30vol% of Ti3AlC2 MAX phase were prepared by Spark Plasma Sintering (SPS) from powders at temperature close to the solidus. Ti3AlC2 has been previously synthesized using insulated SPS technology. Sintered composites reached quasi-full density. Their microstructure has been assessed by SEM and X-ray diffraction (XRD) respectively. Mechanical properties in relationship with the microstructure of all composites were carefully investigated. Vickers hardness (HV5), ultimate compressive strength (UCS) and conventional yield strength (0.2%YCS) increase with an increasing fraction of Ti3AlC2 in the composites and compare favorably with literature. SEM observations of fracture surfaces after compression tests seem to show that cracks initiate in both Ti3AlC2 clusters and a-Mg|MAX interfaces.

Innovative Aspect(s) :

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

Poster ☐ Poster & Reserve Oral ☐

Withdraw ☐ Reason : .....

Notes to author : .....

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EURO PM2024

CONGRESS & EXHIBITION

Technical Programme Committee

8th of February 2024

MATERIALS

NON FERROUS MATERIALS

EPMA

european powder metallurgy association

EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M61
ID : 6274499

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Non Ferrous Materials

Author : Mr Nassuato Mirko (Pometon SpA, Italy)

Co-author(s) :

Title : New Developments On The Formulation Of Pure Copper Premixes For The Production Of Parts For E-Vehicles And Electronic Applications

Keyword(s) :
EV Sintering Parts, Pure Copper for Classical Sintering, New Applications for Pure Copper Powder, Bus Bars Production, Electrical Components

Abstract :
Thanks to its high electrical conductivity, durability and malleability, copper is widely used for EV and for electronic components. EV use more than double the copper of an internal combustion engine automobile and it is also used heavily in EV-infrastructure like charging stations and in electrical grid infrastructure. Sintered Copper components could be part of the transition from combustion to electric engine and EV revolution. Pometon, by the experience on production of ECP and WA copper, continues to develop improved ready to press products to meet the needs of the classical sintering production process for the fabrication of copper components. This new study shows the developing of a high purity and highly densifying copper powders in particular improving the usage of the Premixes (flowability, comprimibility and dimensional changes) and the conducibility of the sintered parts to obtain the chemical, physical and mechanical characteristics needed for E-automotive and electronic applications.

Innovative Aspect(s) :
Massive usage of the pure copper premixes (new product) in the classical sintering (old technology) for EV applications (new application). Find the right compromize between usage of high purity powder (flowabiltiy, compressibility and dimensional changes) and electrical consucibility|mechanical properties of the sintered parts.

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

Poster ☐ Poster & Reserve Oral ☐

Withdraw ☐ Reason : .....

Notes to author : .....

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M62
ID : 6280917

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Non Ferrous Materials

Author : Mr Lin Hsuan Min (National Sun Yat-sen University, Taiwan)

Co-author(s) : Prof Kuo Che Nan (National Sun Yat-sen University, Taiwan)

Title : Microstructure Evolution Of Cu-based Metallic Glasses Between Different Scanning Strategies By Laser Powder Bed Fusion

Keyword(s) :
Cu-based, Bulk Metallic Glass, Scanning Strategies

Abstract :
Additive manufacturing (AM) technologies such as Laser Powder Bed Fusion (LPBF) enable Bulk Metallic Glasses (BMGs) production by exploiting high cooling rates and small-scale molten pool characteristics. LPBF theoretically offers ideal conditions, but challenges remain. Densification is affected by laser power, scanning speed, hatch distance, and layer thickness, nevertheless, among the stacked molten pool, the reheating situation between them resulted in heat affected zone (HAZ), causing amorphous-to-crystalline transformation.To overcome these processing disadvantages, a two-step scanning strategy, repetitive scanning, is proposed in this study. Initial low-energy-laser exposure forms an irregular porous structure, enhancing heat conduction, which is expected to minimize HAZ. Subsequent high-energy-laser exposure ensures complete melting. The study compares single and repetitive scanning strategies, analyzing phase formation, densification, microstructure, and micro-mechanical properties through XRD, DSC, SEM|EDS, and nanoindenter tests.

Innovative Aspect(s) :

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

Poster ☐ Poster & Reserve Oral ☐

Withdraw ☐ Reason : .....

Notes to author : .....

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M63
ID : 6281709

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Non Ferrous Materials

Author : Dr Panzeri Davide (Politecnico di Milano, Italy)

Co-author(s) : Prof Veronesi Paolo (Università degli Studi di Modena e Reggio Emilia, Italy); Prof Rivolta Barbara (Politecnico di Milano, Italy); Prof Gerosa Riccardo (Politecnico di Milano, Italy)

Title : Aging Treatment Of Selective Laser Melted Alloy 625: Mechanical Strength And Corrosion Resistance

Keyword(s) :
Superalloys, Alloy 625, Aging Treatment, Mechanical Property, Corrosion Resistance

Abstract :
Additive manufacturing is nowadays increasingly adopted to produce a large variety of components, especially with complex geometries. A deep investigation and optimization of the mechanical and corrosion performance of the selective laser melted Alloy 625 is extremely useful to support designers in the transition from the conventional to the additive manufacturing technology. Even though the selective laser melting technique is still associated with too high production costs and low productivity to enable a broader expansion, it permits to obtain excellent mechanical and corrosion properties compared to those of the conventionally manufactured alloy. Despite the additively produced material shows outstanding performance already in the as-built condition, aging treatments permit further strength improvement enabling possibility of reducing thicknesses, mass, resources consumption and environmental emissions. However, the balance between the mechanical and corrosion properties is critical and it requires a careful tuning of the heat treatment parameters.

Innovative Aspect(s) :
Nonstandard single- and double-aging treatments are investigated and optimized to permit further strength improvement and consequently reduce thicknesses, mass, resources consumption and environmental impacts.

Reviewer's name : ……..

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

Poster ☐ Poster & Reserve Oral ☐

Withdraw ☐ Reason : ……

Notes to author : ……

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M64
ID : 6281783

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Non Ferrous Materials

Author : Mr Delagnes Adrien (Université Paris-Saclay, CEA, Service de Recherche en Matériaux et procédés Avancés, France)

Co-author(s) : Dr de Carlan Yann (Université Paris-Saclay, CEA, Service de Recherche en Matériaux et procédés Avancés, France); Ms Hamann Clémence (Université Paris-Saclay, CEA, Service de Recherche en Matériaux et procédés Avancés, France); Prof Dr Bacroix Brigitte (CNRS, UPR 347, Laboratoire des Sciences des Procédés et des Matériaux, Université Sorbonne Paris Nord, France)

Title : Study Of The Nanoprecipitation Of Gamma' (Ni3Al) Phase In New Nickel-based Alloy For Molten Salt Reactors

Keyword(s) :
Nanoprecipitation, SPS, HIP, Nickel Based Alloy

Abstract :
Nickel-based alloys are attractive materials for nuclear industry and in particular for Molten Salt Reactors (MSR). They are especially considered for neutron reflectors or heat exchangers. These alloys have many advantages such as high mechanical properties at high temperature and good corrosion resistance in chloride salt. A new nuance for MSRs is being developed at CEA. This alloy is obtained after consolidation by SPS and by HIP treatment of powders obtained by atomization. To resist to irradiation, it is necessary to carefully control the nanoprecipitation in the material. This presentation aims to show that the use of different characterization techniques and in particular Small Angle X-rays Scattering (SAXS) makes it possible to specify the thermo-mechanical treatments to be carried out to obtain the desired state of precipitation in this new alloy.

Innovative Aspect(s) :
This material is a new innovant material for MSR developed to answer the challenges such as corrosion salt, irradiation damage and mechanicals properties.

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

Poster ☐ Poster & Reserve Oral ☐

Withdraw ☐ Reason : .....

Notes to author : .....

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M65
ID : 6282053

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Non Ferrous Materials

Author : Dr Kovacik Jaroslav (Łukasiewicz Research Network-Institute of Non-Ferrous Metals, Poland)

Co-author(s) : Dr Ing Kołacz Dariusz (Łukasiewicz Research Network-Institute of Non-Ferrous Metals, Poland); Dr Ing Lis Marcin (Łukasiewicz Research Network-Institute of Non-Ferrous Metals, Poland); Dr Ing Kulasa Joanna (Łukasiewicz Research Network-Institute of Non-Ferrous Metals, Poland)

Title : Microstructure And Compression Properties Of Cu-graphite Composites Prepared Via Spark Plasma Sintering

Keyword(s) :
Copper, Graphite, Composites, Spark Plasma Sintering, Compression Properties, Cross Properties, Electrical Conductivity

Abstract :
Mechanical properties of copper -graphite composites ought to be considered when designing their industrial applications in synergy with high electrical and thermal conductivity, low friction coefficient and coefficient of thermal expansion.Copper -graphite composites in range of 15-75 vol.% of graphite were densified using SPS technology at 900?. Microstructures confirmed certain anisotropy for prepared composites. Random orientation is in cross section perpendicular to applied pressure, aligned graphite is in cross sections parallel to applied pressure.Compression properties: 0.2% yield stress, compression strength, reduction of height and modulus of elasticity were determined. Compression properties of copper-graphite system are nonlinear on composition, with increasing graphite volume fraction they are decreasing.Fracture surfaces were investigated. At 15 vol.% of graphite fracture is via ductile tearing, with increasing vol.% of graphite, intergranular fracture takes place. Some cleavage fracture paths are partially observed. Finally cross properties of compression properties and electrical conductivity were investigated.

Innovative Aspect(s) :
Mechanical properties of copper-graphite composites are determined by properties of used materials, volume fraction of them and final composite microstructure. As copper and graphite do not react due to low solubility of them, their mechanical properties depend on the microstructure and mechanical properties of copper and graphite. The mechanical properties of copper -graphite composites ought to be taken into the account when considering their possible industrial applications in synergy with high electrical conductivity, high thermal conductivity, low friction coefficient and coefficient of thermal expansion.The innovative aspect of this work is to determine compression properties of copper -graphite composites prepared by SPS. This will enable to investigate the cross property connections between compression properties and electrical conductivity.

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

Poster ☐ Poster & Reserve Oral ☐

Withdraw ☐ Reason : .....

Notes to author : .....

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M66
ID : 6281565

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Non Ferrous Materials

Author : Mr Mossop Theo (University College Dublin, Ireland)

Co-author(s) : Dr Celikin Mert (University College Dublin, Ireland); Dr Heard David (Stryker, USA); Prof Browne David (University College Dublin, Ireland)

Title : Anomalous Solidification Behaviour Of Ti-Nb-Ta Alloys Under Rapid Cooling Conditions

Keyword(s) :
Beta-Titanium, Rapid Solidification, Alloy Design, Solidification, Microsegregation, Ti-Nb-Ta

Abstract :
Processing ß-Titanium alloys via metal additive manufacturing (AM) have high potential to be used for biomedical applications, hence understanding their solidification behaviour under rapid cooling is critical.The solidification structures of Ti-Niobium-Tantalum (Ti-Nb-Ta) based alloys were investigated under various cooling rates using rapid solidification suction casting. An anti-solute trapping effect was determined for a ternary Ti-Nb-Ta alloy. In relatively slower cooled samples the microsegregation was in line with Scheil-Gulliver theory, however under more rapid cooling, the microsegregation increased significantly. In thermodynamically similar binaries, Ti-Nb and Ti-Ta alloys, typical solute-trapping effects were found, where the microsegregation tended towards unity with a reduction in casting diameter.The anomalous microsegregation had the effect of stabilizing additional ß-phase content of the as-solidified ternary alloy – reducing the otherwise favoured martensitic a" content and resulting in a dual-phase structure where the dendrites are primarily ß-phase and the interdendritic regions are a" martensite.

Innovative Aspect(s) :
The high-cooling rate solidification of AM-alloys is integral to the adoption of the technology. This work illuminates fundamental knowledge gaps in the microstructure evolution of beta-Ti alloys under rapid solidification conditions. This work also shows how this can have macroscopic effects on as-cast parts through alteration of the phase content beyond what is predicted by thermodynamic modelling. Detailed understanding of the microstructural evolution under rapid cooling will support studies on novel Ti alloy design for AM and other rapid solidification technologies, as well as will improve post-processing heat treatment methods.

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

Poster ☐ Poster & Reserve Oral ☐

Withdraw ☐ Reason : .....

Notes to author : .....

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M167
ID : 6283958

Requested presentation type : Poster Presentation

Topic : Materials **Subtopic :** Non Ferrous Materials

Author : Dr Ing Kołacz Dariusz (Lukasiewicz Research Network - Institute of Non-Ferrous Metals, Poland)

Co-author(s) : Dr Ing Lis Marcin (Lukasiewicz Research Network - Institute of Non-Ferrous Metals, Poland); Dr Bilewska Katarzyna Lukasiewicz Research Network - Institute of Non-Ferrous Metals, Poland); Dr Kamińska Małgorzata (Lukasiewicz Research Network - Institute of Non-Ferrous Metals, Poland); Dr Ing Wrona Adriana (Lukasiewicz Research Network - Institute of Non-Ferrous Metals, Poland); Dr Ing Kulasa Joanna (Lukasiewicz Research Network - Institute of Non-Ferrous Metals, Poland); Dipl-Ing Krukowski Karol (Lukasiewicz Research Network - Institute of Non-Ferrous Metals, Poland)

Title : Influence Of Temperature Of Sintering Process Using Spark Plasma Sintering Method On The Properties Of Ti0.5Co0.5 And Ti0.65W0.35 Sinters

Keyword(s) :
Titanium, Cobalt, Tungsten, Powder, Sinters, Spark Plasma Sintering, Targets

Abstract :
The article presents the properties of Ti0.50Co0.50 and Ti0.65W0.35 sinters after the Spark Plasma Sintering process. The pressure sintering process was conducted using three different sintering temperatures: for Ti0.50Co0.50 - 1100°C, 1200°C, 1300°C and for Ti0.65W0.35 - 1200°C, 1300°C, 1400°C. The process was carried out using the following sintering parameters: sintering pressure 35 MPa, sintering time 10 minutes, heating rate 100°C|min. Ti-Co and Ti-W mixtures were made by wet mixing of metal powders using acetone. After the sintering process, the phase composition, microstructure, density, hardness, and electrical conductivity were examined. Appropriate selection of the SPS sintering parameters allows obtaining good-quality sinters intended mainly for sputtering targets.

Innovative Aspect(s) :
The obtained research results are a valuable source of knowledge that can be used when designing the production process of Ti-Co and Ti-W alloys for both scientific and utilitarian purposes. The conducted tests of density, electrical conductivity, hardness, microstructure, and phase composition allow for the selection of optimal parameters for the production of these materials.

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

Poster ☐ Poster & Reserve Oral ☐

Withdraw ☐ Reason : .....

Notes to author : .....

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M168
ID : 6283992

Requested presentation type : Poster Presentation

Topic : Materials **Subtopic :** Non Ferrous Materials

Author : Miss Chien Tsai Lin (National Sun Yat-sen University, Taiwan)

Co-author(s) : Prof Kuo Che Nan (National Sun Yat-sen University, Taiwan)

Title : Development Of 3D Printing High Strength Aluminum Matrix Composites

Keyword(s) :
Composites, Additive Manufacturing, Mechnical Properties

Abstract :
The aluminum matrix composites (AMCs) manufactured using additive manufacturing (AM) technologies, such as selective laser melting (SLM), exhibit excellent properties like lightweight and high strength. Therefore, it has great potential for application in the aerospace and vehicle industry. Among them, the most studied 3D printing AMCs is SiC reinforced AlSi10Mg. However, these composite materials are prone to form intermetallic compounds at the interface between AlSi10Mg and SiC during the 3D printing, leading to material embrittlement and limited strength improvement. In this study, Scalmalloy is used as the matrix, and a low energy density parameter is introduced to prevent the formation of intermetallic compounds. By adding different volume fractions of SiC particles, the addition limit of the SiC in this system can be explored, and the trend of the strengthening effect can be studied through the tensile test results.

Innovative Aspect(s) :

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

Poster ☐ Poster & Reserve Oral ☐

Withdraw ☐ Reason : .....

Notes to author : .....

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EURO PM2024

CONGRESS & EXHIBITION

Technical Programme Committee

8th of February 2024

MATERIALS

OTHER PM MATERIALS

EPMA

european powder metallurgy association

EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M67
ID : 6265975

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Other PM Materials

Author : Mr Saviot Adrien (Laboratoire ICB, France)

Co-author(s) : Dr Le Gallet Sophie (Laboratoire ICB, France); Prof Sallamand Pierre (Laboratoire ICB, France); Prof Jouvard Jean Marie (Laboratoire ICB, France)

Title : Influence Of Powder On Phase Transformation In AlCoCrFeNi High Entropy Alloy Obtained By SPS

Keyword(s) :
AlCoCrFeNi, SPS, Phase Tranformation, Microstructure

Abstract :
The study focuses on AlCoCrFeNi high entropy alloy, known for its mechanical and high-temperature properties. While conventional melting processes of the equimolar AlCoCrFeNi composition result in a brittle material with a BCC|B2 spinodal microstructure, powder metallurgy offers the potential for additional phases and microstructures, that can lead to new properties. Pure elemental mixture powders and pre-alloyed powders were investigated, with mechanical activation or annealing at 1000°C. Both favored the formation of FCC phase over BCC, with annealing having a more pronounced impact. Spark Plasma Sintering at temperatures up to 1100°C further promoted FCC phase formation or BCC|FCC transition, primarily located at the prior particle boundaries or grain boundaries. Sigma phase precipitation was also observed out of its stability range due to the cooling rate. The study also explored the influence of SPS parameters, including pressure, heating rate, and dwell time, on phase transformations.

Innovative Aspect(s) :
There are several papers about sintering of this HEA but the obtained alloys present high hardness and low ductility. Here we analyzed the influence of all SPS parameters and initial powder influence (phases, microstructures). Influence of treatments like ball milling and annealing on initial powder was also investigated. According that, the objective is too define new parameters for AlCoCrFeNi sintering in order to promote the formation of FCC phase to improve its mechanical properties. A special attention has also been paid on the phenomenons at prior particle boundaries. Currently no published paper investigate this aspect.

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

Poster ☐ Poster & Reserve Oral ☐

Withdraw ☐ Reason : .....

Notes to author : .....

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M68
ID : 6277178

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Other PM Materials

Author : Dipl-Ing Guy Emilien (CEA Saclay, France)

Co-author(s) : Dr Malaplate Joël (CEA Saclay, France); Dr Guillou Raphaëlle (CEA Saclay, France); Prof Dr Boulnat Xavier (INSA Lyon, France); Prof Dr Perez Michel (INSA Lyon, France)

Title : Influence Of C Content On Microstructural And Mechanical Properties Of 14Cr ODS Ferritic Steels

Keyword(s) :
Oxide Dispersion Strengthened Steel, Coarse Precipitation, Carbides, Toughness, Creep

Abstract :
ODS (Oxide Dispersion Strengthened) steels have been developed as candidate materials for cladding in 4th generation fast neutron nuclear reactors for their oustanding performances. Nanoprecipitation has been the most studied part of these alloys, but coarse precipitation is known to have a detrimental effect on impact properties by occuring at grain or prior powder boundaries.Two ODS 14Cr ferritic steels with different C content (220 ppm vs 700ppm) were elaborated using Mechanical Alloying (MA) techniques, including ball milling with Y2O3 and TiH2 powders, followed by a final HIP treatment. Microstructure was characterized using SEM, XRD and SAXS, while mechanical properties were determined by impact toughness, creep and tensile tests.Whereas microstructure and nanoprecipitation are similar in both materials, coarse precipitation of Cr-rich carbides occurs only in high C content alloy. This alloy has higher creep failure time and DBTT, whereas USE (Upper Shelf Energy) is lowered

Innovative Aspect(s) :
Nanoprecipitation control and innvovation is nearly achieved in ODS ferritic steels for Sodium Fast Reactors. While coarser precipitation is likely to occur in the matrix, it is possible to reduce as much as possible their effect on properties. In this study, the challenge was to avoid element contamination (especially C and N pollution) from all steps, including powder atomization, ball milling and consolidation. N pollution was limited by working with powder under vacuum or Ar flushing. Then, making the comparison between a low carbon alloy and a more conventionnal carbon content alloy is possible, attributing effects on carbides precipitation and C presence in the matrix.

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

Poster ☐ Poster & Reserve Oral ☐

Withdraw ☐ Reason : .....

Notes to author : .....

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M69
ID : 6281002

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Other PM Materials

Author : Ms Şahin Gül Çağrı (Istanbul University - Cerrahpasa, Turkey)

Co-author(s) : Ms Temiz Cihan (Istanbul University - Cerrahpasa, Turkey); Prof Dr Mutlu İlven (Istanbul University - Cerrahpasa, Turkey)

Title : Production And Nondestructive Characterization Of Novel High Entropy Alloys

Keyword(s) :
Novel High Entropy Alloys, Powder Metallurgy Method, Non-destructive Tests, Military Applications

Abstract :
In this study, novel high entropy alloys have been produced by using mechanical alloying-powder metallurgy method. The high entropy alloys were produced for military applications. Initially, metal powders were prepared by mechanical alloying in a ball mill by using 6 mm zirconia balls for 15-20 hours at 400 rpm. Then, the high entropy alloy powder mixtures were compacted at about 400 MPa pressure in a hydraulic press, and then the green specimens were sintered in a vacuum environment at a temperature of 1250 °C for 1 hour in a horizontal tube furnace. Properties of the high entropy alloys were studied by nondestructive eddy current test and ultrasonic test. Elastic modulus of the sintered high entropy alloys was characterized by destructive compression tests and non-destructive ultrasonic tests comparatively. Effect of the mechanical alloying process parameters was determined.

Innovative Aspect(s) :
The high entropy alloys specimens were manufactured by mechanical alloying-powder metallurgy method. The casting based methods are not suitable to obtain a homogenaeous compositions because of the segregation due to the density differences of the alloying elements. High entropy alloys was usually prepared by casting. Due to the wide range of alloying elements, it is difficult to obtain high entropy alloys with uniform composition. Although there are several studies on the high entropy alloys, there are very limited studies on the effect of the mechanical alloying process parameters.

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

Poster ☐ Poster & Reserve Oral ☐

Withdraw ☐ Reason : .....

Notes to author : .....

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M70
ID : 6281334

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Other PM Materials

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Title : Hot Pressing Process Optimization Of High Entropy Alloys Using Elemental Powder Mixtures

Keyword(s) :
High-Entropy Alloys, Hot Pressing, Elemental Mixtures

Abstract :
This study investigated the hot pressing of three distinct high entropy alloy (HEA) powder compositions, namely CrMo0.5NbTa0.5TiZr (named HEA-01), AlCrMoNbTi (HEA-02) and AlCrFeNiTi (HEA-03). The experimental design focused on varying temperature and dwell time, while pressure remained constant. Density was adopted as a response, which was assessed through both quantitative (using Archimedes density test with theoretical densities as a reference) and qualitative analysis (via microstructural examination). Subsequent hardness testing was also performed. It was observed that for HEA-01 and 03, fully-dense parts were achieved in conditions where reactions between the constituents occurred, which resulted in squeezing phenomenon during pressing. HEA-02 achieved densities above 99% without major squeezing or melting being reported. In any case, the observed microstructure was considered heterogeneous. Depending on processing conditions, HEA-01 and HEA-02 reached hardness values of 300 ± 11 and 298 ± 33 HV10, respectively, while HEA-03 was measured at 497 ± 23 HV10.

Innovative Aspect(s) :
This work combines hot pressing of High-Entropy Alloys (HEA's) — which has not been not as abundantly reported as other processing routes (such as e.g. arc melting) — and novel HEA powder compositions, different from the ones that are mostly reported (such as Camntor alloy, Senkov alloy, etc.).

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

Poster ☐ Poster & Reserve Oral ☐

Withdraw ☐ Reason : .....

Notes to author : .....

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M71
ID : 6282478

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Other PM Materials

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Title : Influence Of Cr|Ni Ratio On The Formation Of C14 Phases In A Ti7Nb6Cr(4-x)Ni(1+x)VAl Refractory High Entropy Alloy

Keyword(s) :
Refractory High Entropy Alloys, Powder Metallurgy, Hydrogen Storage

Abstract :
Refractory Eutectic High Entropy Alloys (RHEAs) with body-centered cubic (BCC) single-phase structures have attracted extensive attention in hydrogen storage due to their unique structural characteristics and excellent performance. A general observation shows that BCC structures form more stable hydrides than Laves phase-based hydrides. In the present study, several Ti7Nb6Cr4-xNi1+xyVAl (x=0,1,2) RHEAs obtained by high-energy mechanical alloying were investigated to understand the influence of the Chromium|Nickel ratio on the transition from BCC and C14 Laves phase into a single BCC phase. The research was conducted through SEM and X-ray diffraction analysis. Additionally, several thermodynamic parameters such as the enthalpy of mixing (?Hmix), size difference (d), valence electron concentrations (VEC), and electrons per atom ratio (e|a) have been correlated with the experimental data.

Innovative Aspect(s) :
For the potential use of HEAs in hydrogen storage, it will be necessary to balance the stability of BCC-C14 Laves phases, as the BCC structures enhance hydrogen storage while the C14 phases increase the performance of absorption|desorption cycles. Therefore, the present study will provide important insights for the future development of HEAs in hydrogen storage technology.

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

Poster ☐ Poster & Reserve Oral ☐

Withdraw ☐ Reason : .....

Notes to author : .....

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M11
ID : 6278541

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Other PM Materials

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Title : HEA Matrix Composites Processed Via Hot Press Sintering

Keyword(s) :
High Entropy Alloy, Metal Matrix Composite, Reaction Sintering, Hot Press Sintering

Abstract :
The AlCrFeMnMo HEA shows high hardness properties. In order to further improve its hardness, an AlCrFeMnMo HEA matrix composite has been fabricated by hot press sintering of a mixture of pure metallic elements and reinforcements powders. During the sintering process, the metallic powders react and form, through diffusion, the homogeneous BCC HEA matrix. This original method allows for faster processing of composite materials without requiring pre-alloying, thus bringing time and energy gains. Different sintering conditions and post-sintering thermal treatments were carried out. Different reinforcements were studied such as alumina or titanium diboride. The lattice structure and chemical homogeneity of the HEA matrix have been characterized. The dispersion of the reinforcements as well as the interfaces with the matrix were also investigated. The effect of reinforcement was evaluated by measuring the mechanical properties such as hardness and compressive strength.

Innovative Aspect(s) :
The innovative aspects of this study are mainly the following: The Fabrication of a new HEA Matrix Composite with interesting properties ; The use of a novel less energy consuming and faster fabrication route, consisting in producing the HEA and sintering the composite in the same step.

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

Poster ☐ Poster & Reserve Oral ☐

Withdraw ☐ Reason : .....

Notes to author : .....

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M14
ID : 6281538

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Other PM Materials

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Title : Role Of Nb Addition In W-Ni-Fe And W-Ni-Fe-Co Tungsten Heavy Alloys

Keyword(s) :
Tungsten Heavy Alloy, W-Nb Intermetallics, Sinterability

Abstract :
The potential advantage of adding niobium to tungsten heavy alloys owing to its lower thermal conductivity and specific heat beneficiary for kinetic energy penetrators is still unexplored. The effect of Nb addition in WHA for its sinterability, densification and microstructure attributes is investigated in this study to explore this uncharted area. In this study, two different compositions of WHA, 90W – 7:3(Ni:Fe) and 90W – 6:2:2(Ni:Fe:Co), were blended with Nb at different concentrations (1.25, 2.5 and 3.75 wt%) followed by compaction and sintering in a reducing atmosphere at 1500 oC. The finding suggested larger tungsten grain formation with Nb addition in both the alloy compositions along with formation of Nb-oxides and W-Nb intermetallics. Increasing Nb concentration hindered sinterability and densification in the Ni:Fe alloy, but an opposite trend was found for the Ni:Fe:Co alloy. This study offers insight into using niobium as a promising alloying element in tungsten-heavy alloys (WHA).

Innovative Aspect(s) :

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

Poster ☐ Poster & Reserve Oral ☐

Withdraw ☐ Reason : .....

Notes to author : .....

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M102
ID : 6283052

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Other PM Materials

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Title : Combustion Synthesis Of Nacre-like Architectured High Entropy Ceramics

Keyword(s) :
Nacre-Like Architecture, High Entropy Materials, Combustion Synthesis

Abstract :
Renewable energies are a competitive and promising alternative to fossil fuels, as they have remarkable potential to convert various sources of energy into electricity without greenhouse emissions. The next generation materials for renewable energy should comprise high fracture toughness without sacrificing hardness, and straightway absorbance of sunlight, exhibit enhanced magnetic susceptibility, provide higher efficiencies and cost reduction. The quest for coveted materials has spawned the idea of novel high entropy ceramics that ideally combine superior features of metals and ceramics. As an added value, a bioinspired architecture that mimics mother-of-pearl in these materials will contribute to their unusually high fracture strength and reduce reflectivity over a wide range for solar energy harvesting. We have produced high purity ceramics at affordable costs from available precursors, with a long shelf life by means of an environmentally friendly self-propagating high-temperature synthesis (SHS) with very low power consumption, and easy to scale (kg|min).

Innovative Aspect(s) :
Nacre-like hierarchic microstructure was bioreplicated in high-entropy ceramics for the first time by means of combustion synthesis.

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

Poster ☐ Poster & Reserve Oral ☐

Withdraw ☐ Reason : .....

Notes to author : .....

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EURO PM2024
CONGRESS & EXHIBITION
Malmö, Sweden
29 September - 02 October 2024

Paper Number : M114
ID : 6281583

Requested presentation type : Oral Presentation

Topic : Materials **Subtopic :** Other PM Materials

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Co-author(s) : Mr Antikainen Atte (VTT Technical Research Centre of Finland Ltd., Finland); Mr Lindroos Tomi (VTT Technical Research Centre of Finland Ltd., Finland); Mr Lagerbom Juha (VTT Technical Research Centre of Finland Ltd., Finland)

Title : Control Of Nitrogen In Additive Manufacturing Of Austenitic Nickel Free Stainless Steel

Keyword(s) :
Nitrogen, Additive Manufacturing, Austenitic Stainless Steel, Nickel Free, Direct Energy Deposition

Abstract :
Nitrogen alloyed austenitic stainless steels are known for their corrosion resistance, mechanical properties, and stable non-magnetic nature. As long as the nitrogen content remains within certain limits, increasing the nitrogen content generally improves all the said properties. However, if the nitrogen content is increased up to a too high level, ductile to brittle transition may take place The correct level of nitrogen is determined by other alloying elements that can have a role in stabilizing the austenite and increasing nitrogen solubility in the melt during manufacturing. In this research, we investigate how to control the nitrogen content of nominally Fe-16Mn-14Cr-0.27C-0.35N steel during direct energy deposition processing using mixtures of nominal and nitrided powders. An emphasis is placed on the corrosion and mechanical properties of the resulting chemical composition and microstructure.

Innovative Aspect(s) :
Innovative aspect of this study is to be able to control nitrogen content in austenitic stainless steels during direct energy deposition processing. By using mixtures of nominal and nitrided powders, the study aims to optimize nitrogen levels for corrosion resistance and mechanical properties. Focus is also on avoiding the ductile to brittle transition that occurs at excessively high nitrogen levels. The research presents how the nitrogen levels can be controlled during manufacturing and also emphasizes the consequential impact on microstructure and corrosion resistance. Study offers potential advancements in the manufacturing of nitrogen alloyed austenitic stainless steels with improved properties, and therefore enhanced materials in various applications.

Reviewer's name : .....

Keynote ☐ Oral ☐ 1☐ 2☐ 3☐ 4☐

Poster ☐ Poster & Reserve Oral ☐

Withdraw ☐ Reason : .....

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