DEPARTMENT OF MECHANICAL ENGINEERING

MEA MAGAZINE

DEPARTMENT OF MECHANICAL ENGINEERING

SRI VENKATESWARA COLLEGE OF ENGINEERING , TIRUPATI

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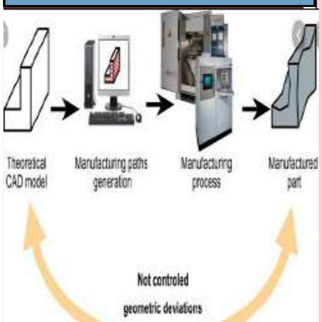

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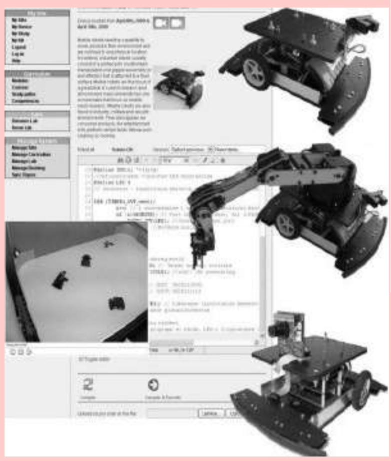
Onlie Engineering for Future Factory

Today's engineering faces with complex system design and rapid time to market demands. The European engineering industry on the same time is faced with Asian competitors who have become from subcontractors to designers and developers (Christophe et al., 2009). According to these trends it is important to bring new concepts and solutions In continuous education the main problem is the lack of time of practicing engineers to participate in lectures or labs, and the common problem is how to exploit newest web-based technology for practical studies in engineering field. The industrial manufacturing and development on the same time needs more effective solutions and cooperation especially amongst the small and medium size companies (SME). Resource sharing and online process control allows reduction of the expenses and exploits the advanced technology for industrial engineering. For education the online engineering gives more flexible access to practical labs without time and place limits, but without losing the quality of the study.

Concept of Online Engineering

The overall concept developed by the consortium of European universities and enterprises by the support of Auto study project (http://autostudy.eu) combines the Distance Engineering Platform which enables to create the lab or factory access with device interfaces. Devices can be actively controlled and monitored over the Internet. The system is applied for the industrial future factory and educational laboratory on the same basis. System concept and architecture does not make any difference either the accessed location is university lab or factory or the device in this location is item on the lab or smart cell in the factory. The distinction is made by the logical data and specific device interface.

In distinction to the systems mentioned above, the consortium has developed full learning concept where the hardware i.e. Distance Lab and Home Lab, are integrated with methodology, curricula and theoretical material as well as web based community support centre for teachers and the learners. The Distance Lab solution for the education and professional use is fully developed and comprises the microcontroller based system access.



The development of integrated interdisciplinary e-tools concentrated on Mechatronics, Robotics and Manufacturing Automation, supported by online mobile sets that can save resources.

A. Ajay Kumar & K.Sainadh

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IV-ME

High Entropy Alloys

The conventional alloys like steel, superalloys, etc. are based on one principal element with alloying additions done to improve their structural and functional properties. In contrast, high entropy alloys (HEAs) are multicomponent alloys having constituents in equiatomic or near equiatomic ratios. They exhibit simple solid solution structures owing to their high configurational entropy. HEAs have been shown to possess good creep strength, excellent oxidation corrosion and wear resistance, high hardness, superior thermal and chemical stability and good magnetic properties. Therefore, HEAs are being explored for variety of applications and have gathered attention of scientific community worldwide. Many groups across the nation are actively working on various facets of high entropy alloysOur group studies diverse aspects of high entropy alloys such as phase prediction using thermodynamic and kinetic principles, fundamental properties like diffusion, magnetism, their applicability as high temperature coating material and their oxidation and corrosion behavior.

Thermodynamic phase predictions in High entropy alloys

The high configurational entropy resulting from the sort of compositions in HEAs was expected to stabilize simple solid solutions in microstructure. But, exceptions to such behavior were reported in several cases. Therefore, search for the rules governing the phase formation in HEAs has become a major academic interest.

Kinetic phase predictions in High entropy alloys

Phase prediction in high entropy alloys (HEA) is a prime challenge for materials engineers as the final phase determines the properties of the HEA. Several approaches depending on thermodynamic, topological or electronic properties of constituent elements have been explored so far without much success.

Diffusion in High entropy alloys

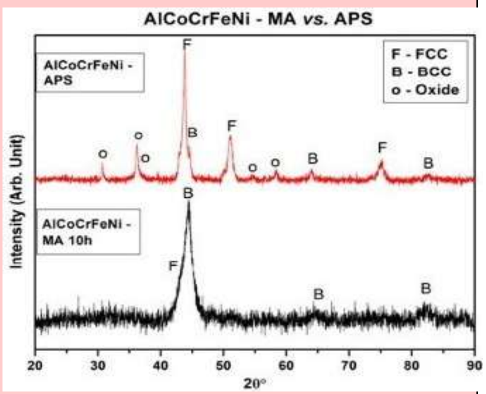
Sluggish diffusion has been put forward as one of the core effects in high entropy alloys (HEAs) and is believed to be responsible for their high thermal stability and creep resistance. Slower diffusion is also presumed to play a role in phase evolution and promote formation of nano-precipitates and amorphous phases in many HEAs. However, till date, reports on diffusion in HEAs are scarce and it has only been measured using inter diffusion approach.

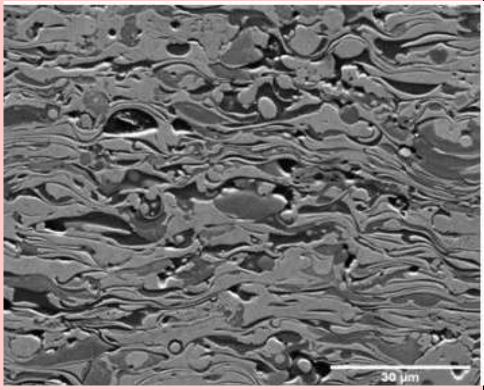
High entropy alloy coatings

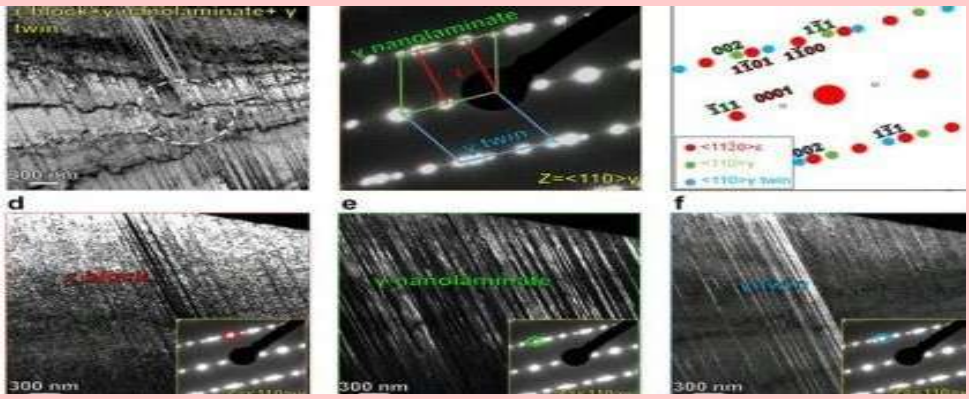
It is centered around finding a HEA composition that can be a possible alternative to present day bond coats used in thermal barrier coatings. Traditionally, TBCs are thermally insulating ceramics bonded onto superalloy components via metallic bond coats, which are usually Ni based dual phase alloys having sufficient Al to form an oxidation resistant alumina layer during service.

Thermal stability of High entropy alloys

Properties of materials play a major role in any application. The properties of a material depend on the structure. The ability of retaining those properties depends on the stability of that structure in different environments like high/low temperature, corrosive environment, heavy loads and high speed applications.







Asish Kumar Dash & Y.Vamsi-17BF1A03B7 & 17BF1A0362– III ME

Additive Manufacturing Process

In this area, various nano-finishing processes and strategies like Magnetorheological. Abrasive flow finishing (MRAFF) is utilized to develop surface finishes less than 100nm which are heavily utilized for prosthetics, implants, nuclear implants reactors, micro-mirrors etc. The magnetorheological fluids demonstrate change in apparent viscosity under external magnetic fields. In this process, a viscous slurry made of carbonyl iron particle and the abrasive grains are passed through external magnetic fields resulting in their local increase in viscosity. This leads to positive pressure of the abrasive particles on the metal pipe interiors through which the slurry is passed.

The field of manufacturing continues to evolve with each passing year. The advent of new processes, tools and equipment allow manufacturing companies to produce products more efficiently. A general framework of the emerging risks linked with advanced manufacturing processes and technologies is showed. For this, the systemic and occupational nature of said risks is considered.

With typical pressures from 400 to 2,070 bar (5,800 to 30,000 psi) and temperatures up to 2,000°C (3,632°F), HIP can achieve 100% of maximum theoretical density and improve the ductility and fatigue resistance of critical, high-performance materials. The components from 3D-printing, regardless of method (EBM, SLM, etc.), benefits greatly from Hot Isostatic Pressing.

Hot Isocratic Pressing (Hipping) has been used successfully by manufacturers around the world. HIP is used to eliminate pores and remove defects, i.e. nitrides, oxides and carbides, to dramatically increase the material properties. Additive Manufacturing (AM), also known as 3D printing is rapidly taking hold in demanding markets such as aerospace and medical implants. Hot Isostatic Pressing and Heat Treatment combined eliminates pores and thus increases the ductility and fatigue resistance of parts which are often safety and quality critical. The aerospace industry is planning to use additive manufacturing for mass production of critical metal alloy parts.

Additive manufacturing (AM), broadly known as 3D printing, is transforming how products are designed, produced, and serviced. AM enables on-demand production without dedicated equipment or tooling, unlocks digital design tools, and offers breakthrough performance and unparalleled flexibility across industries. But, knowledge remains one of the greatest barriers to AM's wider adoption.

Selective Laser Sintering-SLS:

Somewhat like SLA technology Selective Laser Sintering (SLS) utilizes a high powered laser to fuse small particles of plastic, metal, ceramic or glass. During the build cycle, the platform on which the build is repositioned, lowering by a single layer thickness. The process repeats until the build or model is completed. Unlike SLA technology, support material is not needed as the build is supported by unsintered material.

3D Printing

This involves building a model in a container filled with powder of either starch or plaster based material. An inkjet printer head shuttles applies a small amount of binder to form a layer.

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