A Compreshensives Apporach On Sem Apporach On Special Alloys With Nano Structural Approach

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Abstract

Different authors give completely different durations and magnitudes of the nickel ion release from microstructural nitinol into the medium, as well as level of biocompatibility and electro-chemical corrosion characteristics. As is well-known that formation of nanostructures is able to afford to give to materials special, controlled characteristics. On the other hand, the high density of inter-granular surface defects could lead to a poor corrosion performance. The purpose of this study is to investigate the composition, structure and properties of polycrystalline nitinol with nano-grainsor static mechanical properties and biocompatibility.. A significant retardation of the nickel ion release and the absence of titanium ion release in the weakly acidic and neutral solutions with polished samples are observed.The process of nanoparticle formation in this method shows that several kinds of metals and semiconductors nanoparticles can be obtained using this approach. Scanning Electron Microscopy, Atomic Force Microscopy and Transmission Electron Microscopy were used to analyze the nanostructures.

1.0 Introduction:

Conventional monolithic materials have limitations in achieving good combination of strength, stiffness
, toughness and density. To overcome these shortcomings and to meet the ever increasing demand of modern day technology, composites are most promising materials of recent interest. Metal matrix composites (MMCs) possess significantly improved properties including high specific strength; specific modulus, damping capacity and good wear resistance compared to unreinforced alloys. There has been an increasing interest in composites containing low density and low cost reinforcements. Among various discontinuous disperse solids used; fly ash is one of the most in expensive and low density reinforcement available in large quantities as solid waste by-product during combustion of coal in thermal power plants. Hence, composites with fly ash as reinforcement are likely to overcome the cost barrier for wide spread applications in automotive and small engine applications.

The advantages of MMC's over polymer matrix composites are:

1. higher temperature capability
2. fire resistance
3. higher transverse stiffness and strength
4. no moisture absorption

5. higher electrical and thermal conductivities
6. better radiation resistance
7. no outgassing
8. whisker-and particulate-reinforced MMC's can be fabricated
9. with conventional metal working equipment

The disadvantages of metal matrix composites are:

1. higher cost
2. technology relatively immature
3. fabrication methods for fiber-reinforced MMC's complex
4. service experience limited

Compared to monolithic metals, metal matrix composites have:

1. higher strength-to-density
2. higher stiffness-to-density
3. lower coefficients of thermal expansion
4. better elevated temperature properties
    - higher strength
    - lower creep
    - better creep rupture resistance

2.0 Literature review:

Nair, S et al (2015) fabricated aluminium matrix composite (AMC) using stir casting technique, where Al 6061 was the base metal and 10 wt.% silicon carbide (SiC)in powder form with 320 mesh size was the reinforcement material. Al 6061 was melted in a graphite crucible at around 650º C.Into the molten matrix, 10 wt.% SiC powder of 100 mesh size was added. 1% Magnesium powder was also added in order to improve the wettability and decrease the porosity. Stirrer was made out of graphite rod of 100mm length and 25mm diameter for stirring. External threading was done on the stirrer. An internally threaded 3 feet long stainless steel rod was fitted over this stirrer. The mixture was mechanically stirred using a motor of around 250 RPM for 10 minutes before pouring into the mould. The AMC mixture was poured into the mould and allowed to solidify for some time.

Murthy, NV et al (2015) Nanotechnology is spreading in the various demanding fields of engineering and medicines like electronics, defence, aerospace, energy, materials, environment, biotechnology, chemistry, information technology and communication. It created development of new generation nano materials with advanced features and wide range of their applications. Addition of submicron or nano sized particles with aluminium matrix yields superior mechanical and physical properties and changes morphology and interfacial characteristics of nano composites. Aluminium metal matrix composites reinforced by nano particles are very promising materials, suitable for a large number of applications. A wide range of research has been done on the implementation of processing methods. Recently, ultrasonic assisted casting method is used for the production of aluminium alloy based metal matrix reinforcing with nano ceramic particles. In which the formation of clusters were minimized and the nano reinforcements were distributed uniformly in the liquid state aluminium metal matrix composite. The ultrasonic assisted casting process can control the grain size by minimizing agglomeration of nano particles and retaining the enhanced microstructure. This paper reviews the properties and morphology of aluminium based metal matrix nano composites fabricated through ultrasonic assisted casting process.

KarbalaeiAkbari, M et al (2015) in the present study, regarding the theoretical and practical aspects of nanoparticle capture in liquid-state processing of aluminum composite, different volume fractions of TiB2 and TiO2 nanopowders were incorporated into aluminum alloy via stir casting method. Hardness and sliding wear test were carried out to evaluate the mechanical properties of composites. The effects of wear load and reinforcement content on wear rate and friction coefficient of composites were examined. Microstructural studied showed that particle distribution in A356-TiB2 composites was more favorable than that of the A356-TiO2 samples. Results showed that nanoparticles were partially captured by aluminum matrix. With an increase in reinforcement content the amount of porosity and rejected nanoparticles increased.

3.0 Methodology:

Methods of mixing and casting

Metal Matrix Composite: Al SIC +Fly ash + Husk

Total Volume of the Composite: 16cm X 4cm X 3cm =192 cm^2

S.No.	Composition of Material	% by Volume	Volume Occupied (cm^3)	Density ($gm./cm^3$)	Mass (gm.)
1	Al SIC	76%	147.84	2.7	399.17
2	Fly ash	12%	15.36	4.52	69.43
3	Husk	3%	3.84	8.908	34.21
4	Al_2O_3	3%	5.76	3.97	22.87
5	Mg	2%	3.84	1.47	5.64
6	Hexachloromethene	4%	7.68	1.2	9.22

Hex-chloromethane, otherwise called per chloromethane (PCA), C2Cl6, is a white crystalline strong at room temperature with a camphor-like smell in which the mixtures are AISIC, FLY ASH and HUSK.

Metal Matrix Composite: Al 6061 + Fly ash

Total Volume of the Composite: 16cm X 4cm X 3cm =192 cm^2

S.No.	Material Constituents	% by Volume	Volume Occupied (cm^3)	Density ($gm./cm^3$)	Mass (gm.)
1	Al 6061	74%	142.08	2.74	389.30
2	Fly ash	6%	11.52	4.52	52.07
3	Al_2O_3	3%	5.76	3.97	22.87
4	Mg	2%	3.84	1.47	5.64
5	Hexachloromethene	4%	7.68	1.2	9.22

The above figure describes the percentage of volume, density and mass due to the mixture of the components like AL6061 and FLY ASH and due to change in materials it is observed that the mixtures are differencing the volume.

Metal Matrix Composite: Al 6062 + TiB_2 + *Ni*

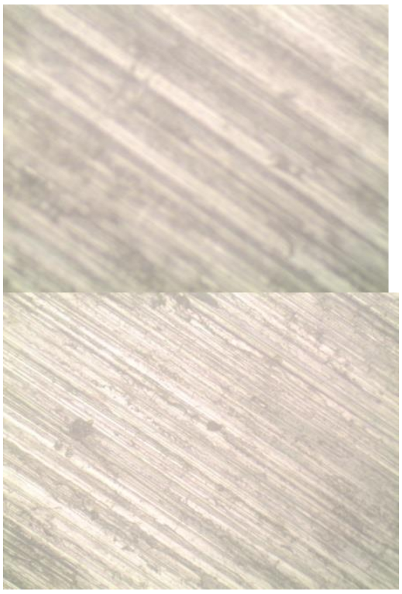
Total Volume of the Composite: 16cm X 4cm X 3cm =192 cm^2

S.No.	Material Constituents	% by Volume	Volume Occupied (cm^3)	Density (gm./cm^3)	Mass (gm.)
1	Al 6062	73%	140.16	2.71	379.83
2	TiB_2	12%	23.04	4.52	104.14
3	Ni	6%	11.52	8.908	102.62
4	Al_2O_3	3%	5.76	3.97	22.87
5	Mg	2%	3.84	1.47	5.64
6	Hexachloromethene	4%	7.68	1.2	9.22

The above figure describes the percentage of volume, density and mass due to the mixture of the components like AL6061, TiB_2 and Ni due to change in materials it is observed that the mixtures are differencing the volume of total composite.

4.0 RESULTS AND DISCUSSIONS:

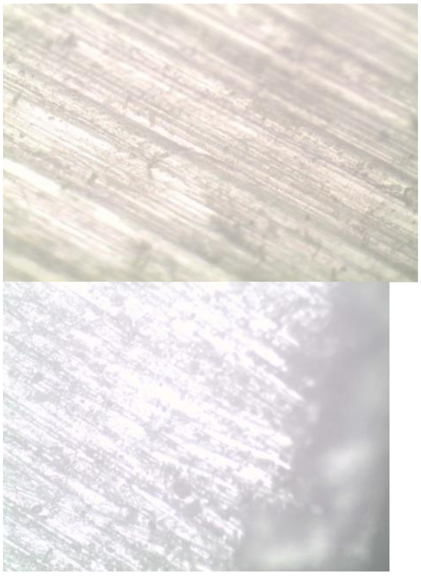
Optimal microscopic results for resultant flow



Results for sample 1&2

The above figure demonstrates the specimen 1 of surface layers of the tube with 300x which is obviously intended to acquire exactness of surface and material is exasperates similarly.

The above figure demonstrates the specimen 2 of surface layers of the tube with 300x which is obviously intended to get exactness of surface and material is totally exasperates.



Results for samples 3&4&5

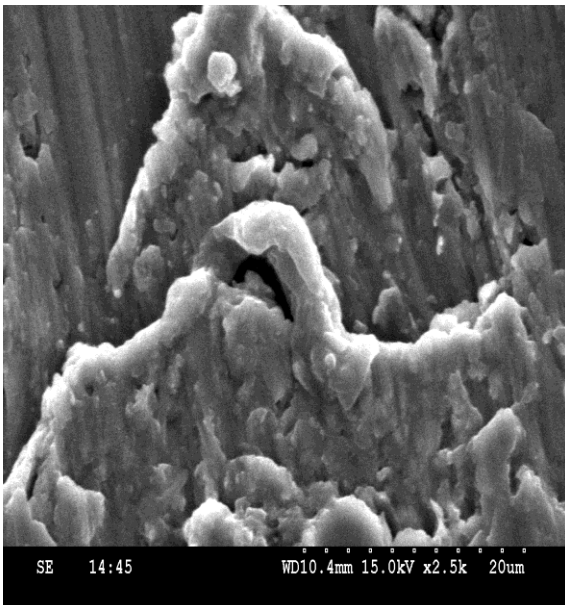
The above figure demonstrates the specimen 3 of surface layers of the tube with 300 x which is plainly intended to acquire precision of surface and material is dispersed up and down the surface.

The small scale basic an examination demonstrating that there is no testimony of any material at one territory in blend throwing process. The particles dispersed with suitable reasonable sizes and no blow gaps or holes find in the manufacture. The surface complete of the articles is great by checking OM pictures introduced.

The information for review can be utilized to next warm conductivity investigation of carbon NANO tubes. NANO fly cinder given preferred outcomes over before in light of its fine structure when contrasted with ordinary fly fiery debris.

SEM IMAGES at S-3000N

Sample-1



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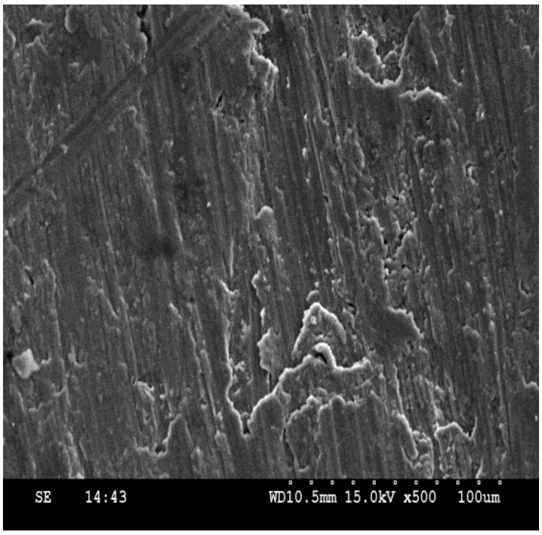
PhotoSize=1000
Vacuum=High

The above figure demonstrates the example 1 of amplified SEM& OM material with amplification of 500 meters which is in liquid state.



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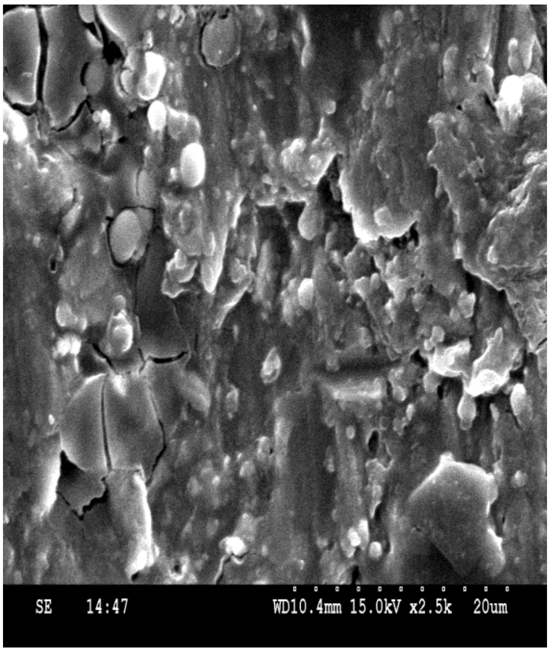
The above figure show the sample-2 of magnifiedSEM& OM material with magnification of 500 meters which is in molten state.

Sample-2



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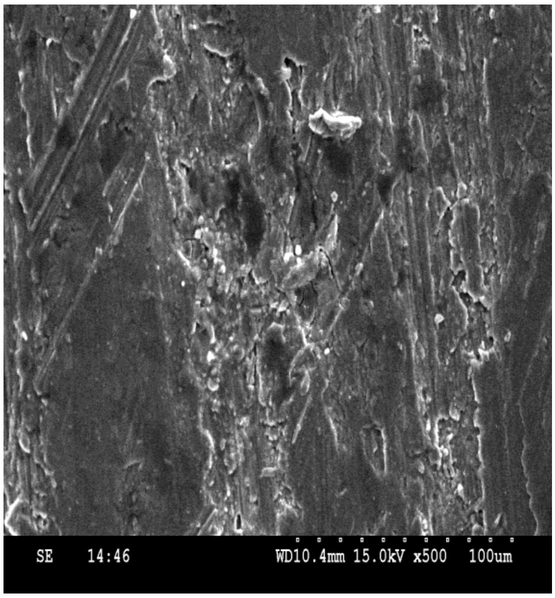
The above figure show the sample-3 of magnified SEM& OM material with magnification of500 meters which is in molten state.



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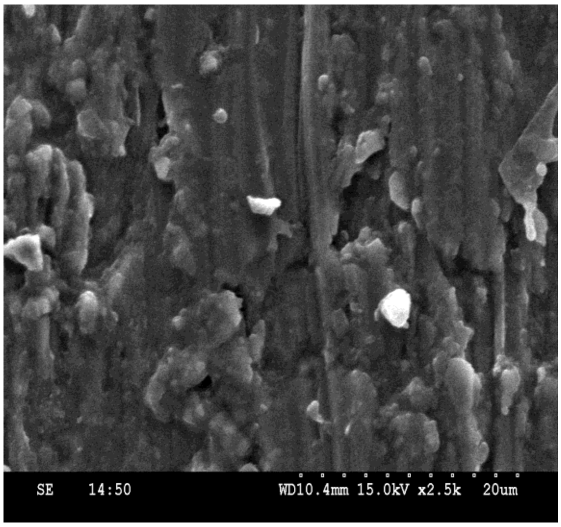
PhotoSize=1000
Vacuum=High

The above figure show the sample-3 of magnified SEM& OM material with magnification of 2500 meters which is in molten state.

Sample-3



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AcceleratingVoltage=15000 Volt
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WorkingDistance=10400 um
SignalName=SE
SubMagnification=2500
SubSignalName=SE
PhotoSize=1000
Vacuum=High

The above figure show the sample-1 of magnified SEM& OM material with magnification of 2500 meters which is in molten state.

Conclusions:

In summary, we have successfully produced the AL6061, TiB_2 andNi nanoparticles using a low temperature plasma bombardment method, well below the melting point of the sample constituents. The method can be used for any other materials to produce nanoparticles of them on any arbitrary substrates (even flexible substrates). It is easy to make a patterned structure of nanoparticles by this method. We believe that the proposed method can produce clusters of nanoparticles and may be the produced films can be used in device fabrications such as transistors, single electron transistors, nanoparticles-based gas sensors etc.

References:

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