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"FABRICATION OF SIC NANOWIRES ON GRAPHITE ELECTRODE"

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ABSTRACT

We have studied the charecterisation of fabrication of silicon nanowires on thermoelectric material. We have presented the thermoelectric enhancement properties of SIC nanowires on graphite electrode.Thermoelectric properties of composite electrode by fabricating SIC nanowires is charecterised by its fig. of merit ZT, which depends upon thermal as well as electrical conductivity of metarial. Normally the thermoelectric fig. of merit ZT, remained stuck in the range of $0 \approx 1^{16}$, however experimental studies have shown that the value of ZT can be significantly improved by incorporating nanowires into a material structure.We have seen that the dynamic behavior of electrodes in furnaces, shows unexpected rupture, so we have studied the fabrication of SIC nanowires,which has enhanced the thermoelectric properties.The capacity of composite anode is approximately 2.7 times greater than the equivalent graphite electrode and the reversible capacity is approx. 1.8 times greater.The reduced size and dimension of the nanowires increases the influence of the surface,leading to a significant modification of the vibrational properties by increasing the surface scattering phonons,which decreases the thermal conductivity and increasing the thermoelectric fig. of merit ZT.SIC nanowire is pursued for its high temp. application, This model also emphasis on wide-band gap, of sic nanowires,thus need to operate under extreme conditions.

Key-words:Emphasis,Enhanced,Incorporating,Thermoelectric fig. of merit,Fabrication,Scattering phonons.

Introduction:

Energy efficiency is understood to mean the utilization of energy in the most cost effective manner to carry out manufacturing process or provide a service. In production units,where melting of steel scrap are being done by using graphite electrodes,we have found that,it shows an unexpected rupture,due to the dynamic behavior of electric arc furnanace using electrodes. To reduce the failure rate,we have seen the performance of composite fabrication of SIC nanowires,graphite electrode. Graphite electrodes are being toughened by SIC, nanowires.[1]We know that performance of electrodes are charecterised by its thermoelectric fig. of merit[2] ZT.As $ZT = \sigma TS^2/K$, where σ =electrical conductivity,K=thermal conductivity& S is seeback coefficient of material.According to Wiedemann-Franz law[3],an increases in thermal conductivity also implies an increase in the electronic contribution to K, due to which the thermoelectric fig. of merit ZT has remained stuck in the range of $0 \sim 1^{16}$.However in recent years,experimental studies have shown that the value of significantly improved by incorporating nanowires into a material structure.In these composite nanowires materials,quantum confinement provides a mechanism for engineering the electronic band structure,potencially reduducing the electrone and hole masses,therby increasing their mobilities and increasing electrical conduvtivity.The reduced size and dimension of nanowires increases the influence of the surface and hence decreases thermal conductivity.This special fabrication increases the thermoelectric fig. of merit ZT.The variation of resistivity as a function of measurement temp. and post implant annealing temp.was studied.It has been found that SIC is persued for its high temp. application, the high resistance layers obtained have to withstand high temp.This emphasis on wide-band gap of the composite thermoelectric material and SIC nanowire on graphite electrode fabrication operate under extreme conditions[3]

RESULT&DISCUSSION:

We have found that SIC ,nanowires,posseses superior,structural,optical and electrical properties by frabricating graphite electrodes.For pure graphite electrodes,in electric arc furnace,when oxygen is blown into the furnace,it reacts with carbon,forming co_2,and gradually burrn away,this leads to the consumption of electrodes.Fabricating these electrodes with SIC NWS, reduces failure as well as consumption markebly.This material fabrication on graphite electrode showed significantly higher conductivity and thermoelectric power factor.These are synthesized using vapour liquid solid process with growth direction (111).It was found that SIC,can dissolved in a basic oxygen furnace,and can also used as a fuel,The additional energy liberated allows the furnace to produce more slag with the same charge of hot metal.It was found a good adjuster for carbon and silcon content in the liquid steel also.The coefficient of thermal expansion was also found to be matched with SIC Nws.This was done by electrolysis method.

CONCLUSION:

Fabrication of SIC Nws on graphite electrode was found to be a material, highly suitable to operate in harsh environment.This fabrication increases the thermoelectric capacity of electrodes also.It reduces failure rate of electrodes and also enhances the productivity of clean steel.It can also operate furnace longer without being opened and without failure and rupture of electrodes as well as most cost effective in energy cost saving.This way energy waste is minimized and overall consumption of primary energy resources is reduced.

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