ABSTRACT

The present investigation envisages production of silicon carbide from rice husk for use in aluminum matrix composites. The thermal degradation behaviour of rice husk (RH), the sequence of transformations in RH upon pyrolysis and the temperature of initiation of silicon carbide (SiC) formation are studied using various techniques such as: thermal analysis, x-ray diffraction, infrared and x-ray photoelectron spectroscopy. The parameters for routine production of beta SiC particulates (β-SiC_p) have been optimized.

The results indicate complete conversion of rice husk silica to β-SiC at temperatures of pyrolysis of 1500^0C. Except for the formation, growth and perfection of β-SiC crystals, conversion of β-SiC to α-SiC was not evidenced in the present studies.

The raw materials for composite production are characterized in detail and composite blends containing various weight fractions of rice husk beta- and commercial alpha silicon carbide reinforcement are wet blended and compacted to billets. These billets are extruded to rods and further subjected to non-destructive and destructive testing. OM, SEM amd TEM are utilized to characterize the microstructures of the extruded composites. The microstructural features thus associated with the processing and testing are then correlated with the mechanical properties.

Composite studies reveal that: rice husk β-SiC *can* also be incorporated into the Al matrix and processed just like the commercial α-SiC. Results obtained from the density, damping as well as TEM studies infer that the interface between the matrix and reinforcement is fairly good. The composite densities, elastosonic young's modulus and CTE values of α/β-SiC_p/Al MMCs are consistent with the ROM predictions. Ductilities as high as 16-17%, YS of about 45-46 GPa and UTS of 70-80 GPa (at temperatures of testing of 450^0C) are achieved.