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Effect of thermal treatment and rolling on mechanical properties and corrosion resistance of aluminum – hematite composite

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Abstract

Recognizing that metal matrix composites have been attracting the attention of various application sectors and there is need for finding newer, cheaper and readily available reinforcements, this paper presents preparation and characterization of an aluminum-hematite composite. The Al-Mg-Si –hematite composite is prepared using liquid metallurgy route by the vortex method. Cast composites were subjected to standard heat treatment used for the base alloy and also to secondary processing (rolling). Samples in all the three conditions are evaluated for tensile and corrosion properties. Both the tensile properties and hardness of the composite were found to increase with increasing hematite particles content, except that tensile strength showed decreasing trend above 6 wt. % hematite content. These results are explained in terms of large residual stresses developed during solidification and also due to the generation of dislocation density due to the mismatch of coefficient of thermal expansion (CTE) between the hard hematitite (ceramic) particles and soft aluminum matrix as well as due to closer packing of reinforcements together with smaller inter particle spacing in the matrix. Both heat treatment and plastic deformation caused by rolling increase the over potential to maintain a constant current density across the specimen. This is attributed to secondary phase precipitates formed due to heat treatment, together with the smaller particles resulted by the rolling.

Biography

Dr C N Chandrappa is currently working as a professor in M S Ramaiah Institute of Technology, He completed his doctorate from Bangalore University, India, His research area is Material science, presently guiding five of the Research students in several Universities, and he has more than 20 years of experience in Teaching.