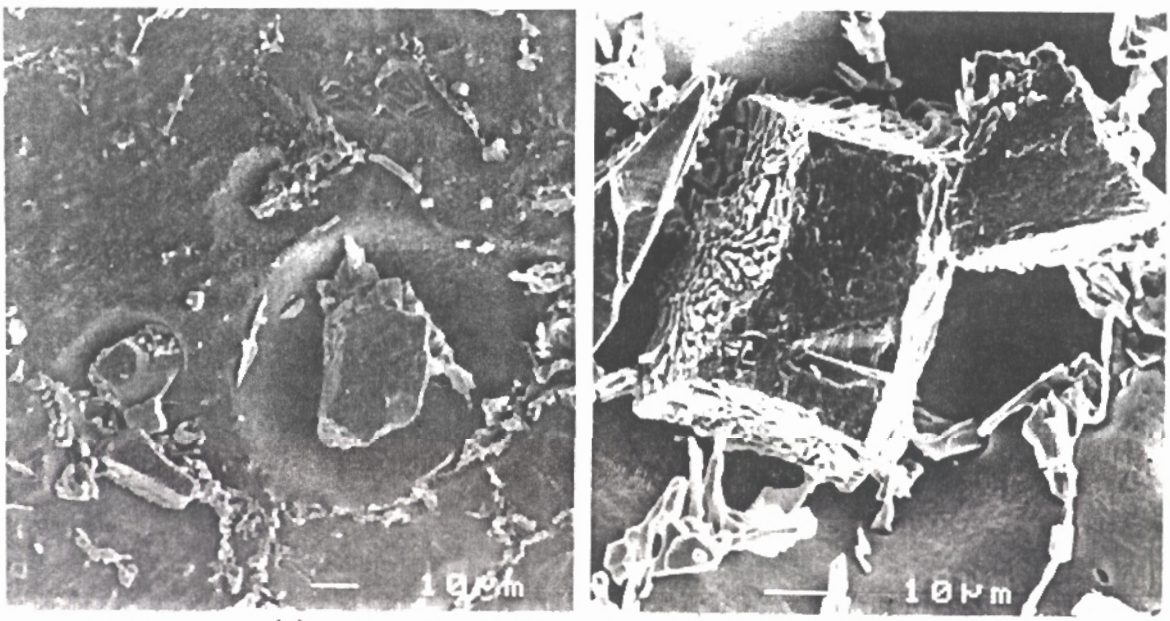
AQUEOUS CORROSION OF PARTICLE REINFORCED ALUMINIUM BASED METAL MATRIX COMPOSITES

Lalgudi V.Ramanathan

Comissão Nacional de Energia Nuclear
Instituto de Pesquisas Energeticas e Nucleares
C.P.11049, Cidade Universitaria, 05422-970 São Paulo.

Aluminium based metal matrix composites (MMC) reinforced with SiC or alumina particles are being considered for a range of applications. The corrosion behavior of metallic materials in general is associated with the presence of heterogeneities and MMCs have a large quantity of these in the form of the reinforcement, particle-matrix interaction products and intermetallic precipitates that result from heat treatments. This paper presents the effect of particle composition (SiC and alumina), pre-oxidation of SiC in air at 1100°C and age hardening of the A356 (Al-Si-Mg) based composites obtained by liquid metal processing on their aqueous corrosion behavior. The corrosion tests consisted of both polarization measurements and immersion tests in 3.5wt% NaCl solutions. Morphological examination of the corroded specimens revealed that the composites corroded at a higher rate than the alloy and pitting was the major form of corrosion. The particle-matrix interfacial regions were the preferred sites for pitting, leading often to particle drop out (figure a). SiC composites pitted more than alumina composites, due to differences in their electrical conductivities. Pre-oxidation of SiC resulted in increased corrosion due to formation of silicon on the SiC particles during composite processing (figure b). The corrosion rates of the SiC composites also increased with aging times.



(a) (b)

Figure . Scanning electron micrographs of: (a) SiC-A356 composite polarized in NaCl and (b) pre-oxidised SiC-A356 composite after 28 days immersion in NaCl.