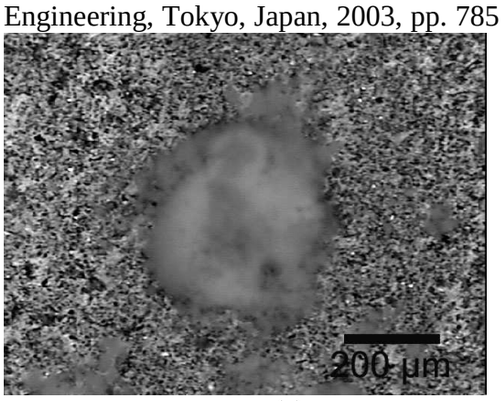
Localized Corrosion Currents and pH Profile over B_4C, SiC and Al_2O_3 Reinforced 6092 Aluminum Composites in ASTM seawater

Hongbo Ding and L. H. Hihara

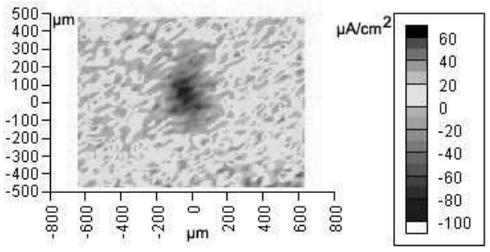
Department of Mechanical Engineering, University of Hawaii at Manoa, Honolulu, HI, 96822

Particulate 6092-T6 Al metal matrix composites (MMCs) reinforced with 20 vol. % of B_4C, SiC and Al_2O_3 exhibited localized corrosion when immersed in ASTM seawater exposed to air at room temperature. The scanning vibrating electrode technique (SVET) revealed that corrosion initiated at localized anodic regions, which transformed into cathodic regions over time. The scanning ion-selective electrode technique (SIET) revealed that the localized anodic regions were acidified, and the localized cathodic regions were alkalinized. The observed anodic-cathodic transformation behavior was attributed to the amphoteric nature of aluminum and the formation of micro-crevices by reinforcement particles left in relief [1]. The localized anodic and cathodic regions were many times larger than the individual reinforcement particle size.

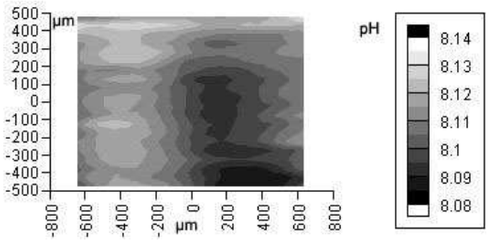
1) L.H. Hihara, Hongbo Ding, Z.J. Lin, "The Formation of Anodic and Cathodic Corrosion Sites on Aluminum Metal-Matrix Composites," in Proceedings of the 8th Japan International SAMPE Symposium, Society for the Advancement of Materials and Process Engineering, Tokyo, Japan, 2003, pp. 785 – 788.



(a)



(b)



(c)

Fig. 1 (a) optical micrograph of 6092-T6 Al/Al_2O_3/20p MMC in ASTM seawater for 9 days; (b) SVET data across the area shown in (a); (c) SIET data across the area shown in (a)

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