Localized Corrosion Currents and pH Profile over B$_4$C, SiC and Al$_2$O$_3$ 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$_4$C, SiC and Al$_2$O$_3$ 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 alkalized. The observed anodic-cathodic transformation behavior was attributed to the amphoteric nature of aluminum and the formation of microcrevices by reinforcement particles left in relief. The localized anodic and cathodic regions were many times larger than the individual reinforcement particle size.


Acknowledgements:

The authors are grateful for support of the Pacific Rim Corrosion Research Program under US Army Contract DAAE30-03-C-1071. The authors are particularly grateful for the support of Dr. Joseph Argento, Mr. John Theis, and Mr. Bob Zanowicz of the Army Corrosion Office.