

03/08/2019

**Effect of Scratching Frequency on the Tribocorrosion Resistance of Al-Mn Amorphous Thin Films**Jia Chen<sup>1,2</sup> and Wenjun Cai<sup>1,2</sup><sup>1</sup>*Department of Mechanical Engineering, University of South Florida, Tampa, FL 33620, USA*<sup>2</sup>*Department of Materials Science and Engineering, Virginia Polytechnic Institute and State University, Blacksburg, VA 24060, USA***Abstract**

Amorphous metallic thin films show great promise for applications where mechanical and chemical attack coexist due to their excellent wear, corrosion, and tribocorrosion resistance. In this research, the effect of scratching frequency on amorphous Al-Mn thin film were studied in simulated seawater by varying the scratching frequency from 0.05 to 1 Hz in reciprocal motion. Scanning electron microscopy (SEM) and transmission electron microscopy (TEM) were applied to characterize the microstructure before and after tribocorrosion testing. Post-tribocorrosion topography measurement was performed using non-contact optical 3D profilometer. It was found that the total tribocorrosion rate, including both mechanical and chemical wear, increased with increasing scratching frequency. Mechanical wear increased with scratching frequency, mostly related to an increment of coefficient of friction and real contact area. On the other hand, chemical wear tends to increase with scratching frequency, most likely due to faster repassivation kinetics at lower frequency. Cross-sectional TEM analysis shows that the disordered surface layer primarily consists of aluminum oxide where manganese is completely absent.

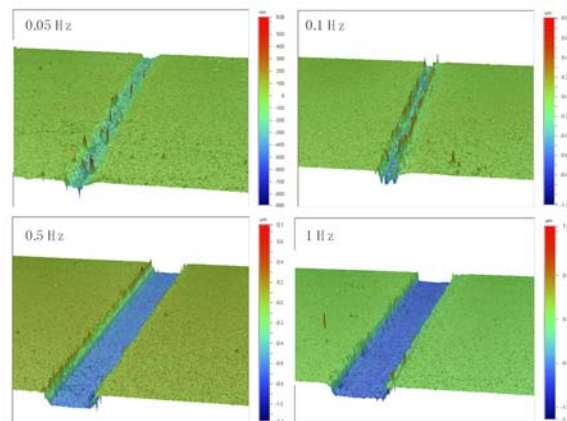


Fig. Optical 3D profilometer

**Biography**

Jia Chen got his master's degree at University of South Florida in 2016. He has spent two years in Ph.D. program at USF since fall 2016. Now, he is pursuing his Ph.D. degree in Dr. Cai's group at Virginia Tech since fall 2018. His research area is on corrosion and tribocorrosion behavior of saturated solid solution, especially on metal alloys.

