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# The origin of passivity in aluminum-manganese solid solutions

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## Abstract

The effects of manganese on the aqueous corrosion of aluminum-manganese alloys were investigated by experiments and atomistic simulations. Electrochemical measurements, x-ray photoelectron spectroscopy, and atom probe tomography analysis indicate that manganese addition enhanced the corrosion resistance of aluminum without participating in the surface oxidation. The selective dissolution of manganese was believed to increase the free volume at the metal/oxide interface to facilitate the formation of a denser, thinner oxide layer with closer to stoichiometry composition. Atomistic simulations showed that the oxide layer compactness increased, and defect density decreased with increasing free volume content in Al, resulting in enhanced barrier characteristics.

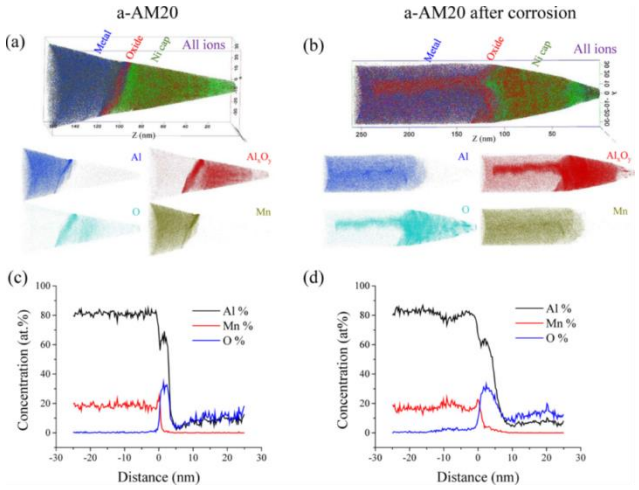


Fig. 1. Atom probe tomograph data

## 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. *He is expected to graduate in this Fall 2021.*