

Exfoliation Growth Kinetics in AA 7075-T651

C. Franck #
cf2g@cms.mail.virginia.edu

K.R. Cooper *
cooperk@lunainnovations.com

R.G. Kelly #
rgkelly@virginia.edu

Department of Materials Science and Engineering
University of Virginia
116 Engineer's Way, Charlottesville, VA 22904
Phone: 434-982-5783 / Fax: 434-982-5799

* Luna Innovations, Inc.
706 E Forest Street
Charlottesville, VA 22903
Phone: 434-972-9952 / Fax: 434-972-9956

Wrought, high-strength aluminum alloys, such as AA 7075, widely used for aircraft structural components are susceptible to exfoliation corrosion in some temper conditions. In exfoliation, corrosion products formed by the selective attack of grain boundary regions force metal away from the body of the material, giving rise to a layered appearance and affecting structural integrity. One of the objectives of the Air Force aging aircraft program is quantitative assessment of the impact of exfoliation corrosion on structural integrity, including the ability to predict the extent of exfoliation with continued service. A lack of knowledge of the kinetics of exfoliation corrosion as a function of grain orientation hinders the quantitative assessment and prediction of its impact on structural integrity. The objective of this work is to develop a test and analysis methodology that will provide a quantitative measure of the exfoliation growth kinetics as a function of grain structure and orientation.

Peak-aged AA 7075 plate was used as the model system for the test protocol development. Parameters investigated included exposure environment and time, the effect of masking procedures to facilitate only end-grain exposure, and orientation of the exposed material relative to the rolling direction (*i.e.*, longitudinal, transverse and short directions). The exfoliation propagation kinetics are analyzed as a function of grain orientation.