Department of Materials Science and Engineering,

PhD Candidacy

5/28/2020 1:00 PM
Online: via Zoom
https://drexel.zoom.us/j/94020952219

Oxidation Resistance of layered-solids for High-Temperature applications

Name: Tarek Ali Elmeligy
Advisor: Prof. Michel Barsoum

Abstract

Many industrial applications such as material processing, power generation and aerospace can have service temperature in the range of 500-1000°C. There is a constant demand for materials able to perform adequately and withstand these high temperatures. High-temperature material candidates (e.g. FeCrAl, and NiAl alloys) increase operational efficiency, and reduces maintenance costs. However, an ongoing challenge for current technology has been protection of materials in high-temperature applications against harsh oxidizing and corrosive environments. In that regard, layered-solids such as ternary transition metal carbides (Mn+1AXn phases) possess low density, high stiffness, and plasticity at higher temperatures, which renders them potential candidates for high-temperature environments. Some Al-containing MAX phases are presented as Al2O3 formers in oxidizing air environments. Discussion is made of their oxidation resistance performance, oxide formation mechanisms and practical assessment of industrial performance. As with other materials, some challenges arise that encourage research to be able to take advantage of the favorable high-temperature properties of layered-solids.