



4th Annual Cal Poly Pomona Student RSCA Conference
March 4, 2016

University Library,

Oral Presentations from 12:45 to 5 pm

Bronco Student Center (Ursa Major),

Poster Session, Performance Presentation, and Reception from 4 to 6:30 pm

Lead Author: Karyna Banuelos

Major: Chemical Engineering

College: Engineering

Co-author(s): Not Applicable

Faculty Mentor(s): Dr. Vilupanur Ravi

Presentation Type: Oral Presentation

Project Title: Effects of chromium diffusion in aluminized nickel chromium alloys

Synopsis: The effect of chromium in aluminized Ni-Cr alloys was investigated in order to understand the mechanisms that create the resulting corrosion-resistant coatings.

Abstract: Metallic alloys are often degraded when used in corrosive, high temperature environments such as in gas turbines or nuclear power plants. To mitigate these effects, the surface of the existing alloy can be modified through the halide-activated pack cementation method by applying a coating that contains the elements to form a protective oxide layer. In this study, pure nickel and nickel-chromium alloys were utilized as the substrates, with aluminum as the coating element. The goal of this study was to investigate the role of chromium in promoting or inhibiting aluminum diffusion. Results show that the chromium content of the alloy has a significant effect on the microstructure of the coating. Microstructural analysis using Scanning Electron Microscopy coupled with Energy Dispersive Spectroscopy (SEM/EDS) show chromium-rich particles near the coating-substrate interface. These particles are present throughout the coating in a zone that gets thicker as the chromium content of the alloy increases. In addition, as the percentage of chromium increases within these particles, that of nickel decreases sharply while the aluminum content remains fairly constant. This suggests that the addition of chromium inhibits the outward diffusion of nickel during aluminization. Coupons will further be studied using image analysis software to determine the fraction of chromium-rich areas in the coating.