

# **Aluminum Powder Property Modification and Characterization**

Laila J. Jallo

PhD candidate

Otto H. York Department of Chemical, Biological and Pharmaceutical  
Engineering

Surface modification of aluminum powders for the purpose of cohesiveness reduction was performed and several samples were prepared. Cohesiveness of these surface modified powders is evaluated at the bulk-scale in consolidated state using a Sevilla Powder Tester (SPT) through unconfined tensile strength and solid fraction. Correlations between the flowability and reactivity for these powders as well as for the initial untreated aluminum powder were established. The powders were characterized using Scanning Electron Microscope (SEM), Seville Powder tester (SPT), angle of repose flowability test, and Constant Volume Explosion (CVE) combustion test, and Thermal Gravimetric Analysis (TGA). The surface modification of micron-sized aluminum powders was done by: (1) dry coating nano particles of silica, titania and carbon black onto the surface of spherical aluminum powders and (2) chemically and physically altering the surface properties of the same powders with methyltrichlorosilane. All surface modifications improved flowability of the powders. CVE measurements indicate that an improved flowability improves the combustion behavior of aluminum powder if the powder treatment does not add an inert component to aluminum. The TGA results do not show significant differences in the reactivity of various powders. Based on combined flowability and CVE characteristics, the silane-modified material gave the best results followed by the powders dry-coated with carbon, titania and silica, respectively.