

Title: Microstructural Observation of Heat Treated Al6061 Powder and Corresponding Cold Sprayed Samples using Electron Microscopy

Authors:

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Abstract:

The microstructures, phase distributions and properties of cold sprayed deposits depend critically on the characteristics of the feedstock powder used. These powders often exhibit non-equilibrium phases and distributions of alloying elements due to the rapid solidification of the powders during production by gas atomization. The effects of pre-spray thermal exposures on the characteristics of common Al alloy powders are being captured in a comprehensive set of “Through-Process Experiments” (TPE) co-ordinated by the WPI team. Here we present electron microscopy studies on Al6061 powders that have been subjected to carefully selected heat treatments designed to manipulate the powder microstructures and properties. It is shown that the initial distribution of the minority phases in the as-atomized powder is consistent with that observed previously. Thus, there are separate Mg-rich and Fe-rich silicide phases at the cell boundaries in the cellular-dendritic microstructure. Changes in the distribution, dimensions and morphology of these phases are tracked as a function of heat-treatment time and temperature, and these features are compared to the corresponding phases in cold-sprayed deposits produced from these powders. The consequences of these observations for the ability to engineer the microstructures of cold sprayed deposits are discussed.

Presenters Bio:

Nadib Akram is a second year PhD student at University of Connecticut in the Materials Science and Engineering program. He is currently working on microstructural investigations of TPE Al6061 powders and cold sprayed deposits. He got his B.Sc. degree in Materials and Metallurgical Engineering in February 2017 from Bangladesh University of Engineering and Technology. He got his MS degree in Materials Science from Missouri State University at the end of Fall 2020.