An In-situ USAXS Study of Microstructural Evolution in a Ni-Based Alloy

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High performance Ni-based alloys are required for use in exhaust valve applications in the next generation, high efficiency automotive engines. These alloys are strengthened through the precipitation of coherent, $Ni_3(Al,X)$ type γ' precipitates. Since these alloys are expected to operate at 870^{o}C and above, microstructural stability of the γ' strengthening precipitates is critical to achieving the desirable performance characteristics of these alloys in this application. *In-situ* USAXS/SAXS offers the ability to characterize particle size and particle size distributions in the aged condition and to monitor their evolution as a function of time at the typical exposure temperatures. We will present the results from an Ultra-small-angle (USAXS)/SAXS/WAXS study of γ' evolution in a model Ni-based alloy. Data obtained from room temperature measurements will be used to characterize the microstructure in the as-aged condition. Results from *in-situ* high temperature ultra-small-angle (USAXS)/SAXS/WAXS measurements will be used to characterize precipitate coarsening behavior in the alloy.

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