UNDERSTANDING HYDROGEN EMBRITTLEMENT/ENVIRONMENT-SENSITIVE BEHAVIOR OF MATERIALS VIA MICROSTRUCTURAL CHARACTERIZATION: ADVANCES, APPLICATIONS AND OPPORTUNITIES

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The correlation of environment-sensitive behavior of materials with microstructure has been important in developing a mechanistic understanding of degradation and embrittlement phenomena. Considerable progress has been made from targeted experiments and post-test microstructural analysis using a variety of techniques. In particular, there have been significant advances in in situ microscopy, particularly *in situ* analytical TEM/STEM, to explore materials-environment interactions in order to gain a more detailed understanding of bulk materials behavior. This talk will review the development of *in situ* stages and gas reaction cells used with high voltage electron microscopes during the 1960's-80's to the impressive advancements over the past ~15 years enabling *in situ* experiments to generate new perspectives on materials-environment reactions, and include examples of recent and current research as well as discuss recent developments to enable new opportunities for research into hydrogen effects on materials.