

In Situ Material Characterization in Harsh Environments

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Materials are utilized in harsh environments such as nuclear reactors, autoclaves, engines, steam generators, down wells, refineries, etc. Understanding how these materials behave in these harsh environments is paramount for designing robust systems. Traditionally, the material behavior is determined by placing the material in the form needed for a material parameter measurement (i.e. corrosion growth coupon, creep specimen, compact-tension (CT) specimen, etc.) into its operating environment for a time, removing it, and then measuring the material parameter in a laboratory environment (the so called cook then look method) and then repeating this process. Although this method gives excellent results, it is time consuming and costly. By designing material parameter measurement systems that can operate in the harsh environment, the material parameters can be measured while in the harsh environment, saving the time necessary to remove, measure, and place back into the system the material being tested. The different material measurements of interest and systems capable of making these measurements in the harsh environments will be discussed.