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Nanocrystalline diamond as stripper foils in the spallation neutron source

Since it first became operational in 2007, the spallation neutron source has utilized nanocrystalline diamond foils to strip the electrons from a hydride ions (H^-), converting them into protons which collide with a mercury target to produce the neutrons used in the facility. The nanocrystalline diamond foils are grown on lithographically patterned silicon wafers and the lower 2/3$^{rd's}$ of the silicon is chemically removed to produce a single edge supported foil (typically 17 mm x 30 mm x 1µm) with a silicon handle for mounting. These foils have greater than 99% stripping efficiency, as required by SNS, and have exceeded expectations in durability, typically lasting over one month with exposure to a>1 MW beam at 1 GeV energy. Results on the development and use of nanocrystalline diamond stripper foils at SNS will be presented, as well as laboratory studies of the transformations that occur in crystalline structure, emissivity and carbon state of the foils from deposition of beam energy into the foil.

Speaker Biography

Dr. Charles Feigerle received a B.S. in Chemistry from the University of Illinois at Chicago in 1977 and a Ph.D in Chemical Physics from the University of Colorado in 1983. Before joining the faculty of the University of Tennessee in 1985, he was a National Research Council Postdoctoral Fellow and staff scientist at the National Bureau of Standards (NBS). He has been the head of the Department of Chemistry at the University of Tennessee since 2011. His research interests lie within the broad umbrella of experimental physical chemistry, with emphasis on laser spectroscopy and surface analysis for discovery and characterization of advanced and emerging materials, including chemical vapor deposition of diamond and boron phosphide.

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