Professor Petros Sofronis, University of Illinois at Urbana-Champaign

Professor Petros Sofronis has been studying the phenomenon of hydrogen-caused embrittlement of materials by coupling materials mechanics with experimental observations at the atomistic scale for nearly 25 years. Dr. Sofronis is supported by the U.S. Department of Energy through the Office of Energy Efficiency and Renewable Energy's Fuel Cell Technologies Program to lead research to understand hydrogen embrittlement of pipeline steel and to develop potential strategies to mitigate these effects. He has recently been chosen to lead the International Institute for Carbon-Neutral Energy Research of Kyushu University, a $10M per year initiative funded by the Japanese government.

Professor Sofronis and his research team are developing and verifying a lifetime prediction methodology for failure of materials used in gaseous hydrogen environments. This work, coupled with strategies to avoid material degradation, is essential for the rapid assessment of using the current natural gas pipeline distribution system for hydrogen transport and for the analysis of new alloys tailored for use in hydrogen related applications. His collaborators include Los Alamos National Laboratory, Sandia National Laboratories, and companies such as ExxonMobil Research and Engineering.

With expertise in solid mechanics that includes elasticity, viscoelasticity, plasticity, and fracture mechanics, his research methodology involves analytical and computational techniques, and in particular linear and nonlinear finite element analysis. As the Associate Head of the Mechanics Programs in the Department of Mechanical Science and Engineering at the University of Illinois at Urbana-Champaign, Professor Sofronis has been investigating hydrogen enhanced localized plasticity (HELP) and hydride mechanisms for hydrogen embrittlement by coupling solid mechanics techniques with experimental observations. His theory on the hydrogen-induced shielding of defect interactions to explain the mechanism of hydrogen enhanced localized plasticity for embrittlement is the first proposed rational explanation of hydrogen-induced fracture involving plasticity effects.

Dr. Sofronis is a fellow of the American Society of Mechanical Engineers and the Japan Society for the Promotion of Science and has received awards and recognition from the National Science Foundation and Ford Motor Company.