NEER FY 2001 PROJECT ABSTRACT	
Grant Number:	01ID14121
Project Title:	Characterization of Helium Bubble Formation and Microcracking in Borosilicate Glasses Using Small-Angle Scattering Techniques
Lead PI:	Brent Heuser, University of Illinois
Abstract:	A research program to investigate helium bubble formation and microcracking in simple borosilicate glasses is proposed. This program is designed to address an important issue-the possible loss of waste immobilization stability due to alpha decay induced bubble formation and concomitant microcracking. Small-angle neutron and x-ray scattering techniques will be used to measure the bubble size distribution as a function of He concentration, annealing and implantation temperature. A comparison of neutron-irradiated borosilicate glass samples (bulk He inventory) and alpha-implanted borosilicate glass samples (surface He inventory) will permit an estimation of the influence of free surfaces on He bubble nucleation and growth. The small-angle scattering techniques will also be sensitive to the formation of cracks induced by bubble growth. Complementary information on helium release rates will be obtained from temperature programmed desorption measurements. In addition, hydrogen depth profile measurements of samples used in water intrusion tests will be performed. Molecular dynamics simulations of helium bubble and crack stability during energetic displacement cascades in simple glasses will be performed as well.