NEER FY 2001 PROJECT ABSTRACT	
Grant Number:	01ID14115
Project Title:	Irradiation Induced Precipitation and Dissolution of Intermetallics in Zr Alloys at High Burnup Studied Using Synchrotron Radiation
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Abstract:	We propose to use advanced characterization techniques, developed in a previous NEER program, to obtain unique experimental information on a very important problem of irradiation?induced microstructural evolution in Zr alloys, namely, the irradiation induced precipitation and dissolution of second phases. This is important, because the distribution of these alloying elements, in precipitates or in solution in the Zr matrix determine fuel cladding behavior at high burnup. The overall objective of these examinations is to understand, quantify and model the overall behavior of alloying elements such as Fe, Cr and Ni in nuclear fuel cladding under irradiation. We propose to examine both neutronirradiated samples and samples that are irradiated with ions under controlled conditions using synchrotron radiation from the Advanced Photon Source (APS) at Argonne National Laboratory to understand the kinetics of precipitation and dissolution of these second phases under irradiation. We propose to measure and quantify, using x-ray diffraction the volume fraction of precipitates in irradiated alloys, as well as the changing alloying element content in the matrix. We have obtained unique neutron-irradiated samples from Bettis Laboratories, and will produce ion irradiated samples using the Tandem Facility at Argonne. We will also perform in?situ ion irradiations using the Intermediate Voltage Electron Microscope at Argonne.