ESTABLISHING METHODS FOR RECYCLING SPENT ZIRCALOY CLADDING
USING A HYDRIDE-DEHYDRIDE PROCESSING ROUTE

A Project Report

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by

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“Deep is the well of truth and long does it take to know what has fallen into its depths”
- Friedrich Nietzsche, 1844-1900
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ABSTRACT


Materials handling and processing equipment and early process development equipment were developed to recycle spent nuclear fuel cladding (i.e., Zircaloy) into a metal powder that may be used for advanced nuclear fuel fabrication. An inert atmosphere glove box for preparation and analyzing of specimens, a hydride process system, and a dehydride process system were designed and fabricated for the purpose of establishing feasibility of recycling Zircaloy cladding hulls from spent nuclear fuel. Initial experiment analysis established criteria for hydriding of tubular Zircaloy specimens. It was found that brittle hydrides can be formed from Zircaloy tubes and crushed to fine powder. The designed dehydride process was built to decompose the zirconium hydride powder formed through the hydride process. Initial analysis of the hydriding apparatus and design recommendations are made.
VITA

Dustin Thomas Kraemer was born in 1980 in Wadsworth, OH, USA, but attended school in nearby Doylestown, Ohio. He has been a student at Purdue University since 1999 and has received the following degree: Bachelor of Science in Nuclear Engineering in December of 2003 while completing the Naval ROTC curriculum. He will receive his Master of Science in Nuclear Engineering degree in August of 2005. He was commissioned as an Ensign in the United States Navy in July of 2005. He will pursue his nuclear career as a naval submarine officer in the United States Navy.