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

A Project Report

Submitted to the Faculty

of

Purdue University Nuclear Engineering

by

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Requirement for the Degree

of

Master of Science in Nuclear Engineering

August 2005

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

ACKNOWLEDGEMENTS

I would like to thank Dr. Sean M. McDeavitt, my major professor, for accepting me as his graduate student and contributing the time and motivation to help me succeed. I would like to thank the faculty of Nuclear Engineering for their support and encouragement in my endeavors at Purdue University. I'd also like to thank Dr. S. Revankar, Dr. R. Taleyarkhan, and Dr. R. Trice for serving as members of my advisory committee. I would like to thank Paul Mews and Eric Howell for their help in building the glovebox. In addition, I would like to thank Adam Parkinson, who will be continuing this research, for his help in running recent experiments and evaluating some of the results.

I would like to acknowledge the U.S. Department of Energy's Nuclear Energy Research Initiative for the support of this research project (NERI ID NO. DE-FC07-05ID14656).

I want to thank the United States Navy for allowing me to pursue my master's degree prior to accepting my commission. I would especially like to thank my friends, who have come and gone, for their understanding while I chased my goals. Finally, I would like to thank my family for their continued support in all I do.

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ABSTRACT

Kraemer, Dustin T. MSNE., Purdue University, August 2005. Establishing Methods for Recycling Spent Zircaloy Cladding Using a Hydride-Dehydride Processing Route. Major Professor: Sean M. McDeavitt.

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.