

WIU CENTENNIAL HONORS COLLEGE
Thomas E. Helm Undergraduate Research Day 2022

Abstract

Poster

Major Chemistry

Faculty Mentor: Brian Bellott

Solid State Synthesis of Lanthanide Intermetallics

Henry Hess

An intermetallic is a solid solution of two metals. A solid solution is much like a normal solution, as the metal in excess is the solvent, and the other compound is the solute. Intermetallics containing lanthanide elements possess unique magnetic properties. By altering the specific lanthanide element, the magnetic moment of an intermetallic will change drastically. Since these intermetallics can produce a broad range of magnetic moments, an intermetallic can be specified for a potential device that requires an exact magnetic moment for the device to run as efficiently as possible. Some examples of devices that require an exact magnetic moment include superconductors and electric motors. The focus of the study is to synthesize these lanthanide intermetallics using the inorganic compounds dysprosium (III) oxide, neodymium (III) oxide, and praseodymium (III,IV) oxide along with sulfur. This was accomplished through the use of a solid state synthesis. These compounds were placed in a sealed tube and heated to 750 degrees C for fourteen days. The contents of the tube were then examined using optical microscopy as well as scanning electron. The scanning electron microscope is used to confirm whether the solids reacted or if no reaction occurred. Using the EDS on the SEM elemental analysis can also be obtained.