Solid state materials can be synthesized by several different methods. A few examples of the current methods are high temperature, sol-gel, and hydrothermal synthesis. Our research is focused on the synthesis of materials at high temperature. The reactants are melted in a specialized furnace at over 500° and allowed to react for two weeks. The samples are then cooled slowly so single crystals may be formed. The first experiment conducted created various single crystal structures, which will allow for the determination of the precise location of atoms in the crystal with respect to every other atom in the crystal. This experiment allowed the synthesis process to be tailored to ensure the creation of complete single crystals.

Currently, approximately 2/3 of all energy input is lost to the environment as waste heat. Recent research has found tin selenide (SnSe) compounds show promise in converting this waste heat into electrical energy. Because of the layered structure of tin selenides, one side of the crystal retains heat, while the other side remains cool. This causes heat to travel through the crystal via electronic carriers, allowing for the creation of electrical energy instead of direct heat loss. This property of tin selenides could result in enormous energy savings.

Using the high temperature methods previously discussed we combined tin, selenium, and lanthanides in order to form tin selenide compounds. Crystals obtained will be examined by optical microscopy. High quality crystals will be analyzed to determine chemical make-up and thermonuclear properties.