Abstract Submitted
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Search for – and growth of – atomic-cage thermoelectrics SARAH LONGWORTH, Missouri State Univ — In this project, we are growing Zn and Al atomic-cage thermoelectrics. Thermoelectric materials convert thermal energy directly into electrical energy by utilizing the Seebeck effect, wherein a voltage is generated by a thermal gradient. Thermoelectrics are particularly useful in that they can be used to harness waste heat generated in the production and consumption of other energy processes. The cage structure of the material, comprised of heavy ions "rattling" within void spaces of the crystal, allows for an increase in the thermoelectric efficiency of the material by interfering with heat conduction via vibration and allowing for conduction via electrons. We are investigating the family of materials with composition MM'_2X_{20} (M, M' = transition or rare earth metals and X = Zn, Cd, or Al) which have the desired cage structures and have already been shown to exhibit thermoelectricity. We are currently utilizing the self-flux method in order to synthesize high-quality crystals of novel materials to be analyzed for thermoelectric properties. Composition and structure of prepared crystals is investigated using energy dispersive spectroscopy (EDS) as well as both powder and single-crystal x-ray diffraction (XRD). Crystals exhibiting promising cage structures will be sent to the National High Magnetic Field Laboratory in Tallahassee, FL to be tested for thermoelectric properties.

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