

## 2016 Anna Louise Hoffman Award for Outstanding Achievement in Graduate Research

**Juli-Anna Dolyniuk**  
**University of California - Davis**



Juli-Anna is examining new transition metal-based thermoelectric bulk materials for her dissertation. Her work is devoted to the creation of a novel class of thermoelectric materials with enhanced properties, conceived via rational materials design. Thermoelectric materials convert heat into electrical energy and refrigerate via an applied current. Thus, they are promising materials for waste heat recovery as they will diminish our dependence on fossil fuels, and they will decrease the associated risk of a future energy crisis.

Juli-Anna's major professor, Dr. Kirill Kovnir, writes that her research has focused on the development of new green energy sources, new bulk thermoelectric materials based on extended cage frameworks (clathrates). Clathrates present the opportunity to simultaneously tune heat and charge transport, effectively generating promising thermoelectric properties; the chemistry of clathrate materials is complex. What is unique about Juli-Anna's project is that it explores the bounds of new transition metal-pnicogen clathrates (which have not previously been highly studied) where the inclusion of a large number of transition metals in the framework leads to enhanced electrical conductivities, and the trapped guest rattlers maintain the low thermal conductivity, an ideal combination for thermoelectrics. Juli-Anna has become a master in the synthesis of solid materials. As a result of her work, Juli-Anna has published seven papers, five of them as a first author, in such journals like *JACS*, *Chemistry of Materials*, *Inorganic Chemistry*, and *Chemistry – A European Journal*. Five more papers are currently in preparation with Juli-Anna as first author. She has also received the prestigious ICDD Ludo Frevel Crystallography Fellowship for her achievements in the field of crystallography.

Her nominator, Susan Kauzlarich, writes that Juli-Anna has developed into a role model for graduate researchers, a leader, and an imaginative scientist. She has been involved in leadership positions organizing an all University of California graduate student research conference. She is a quick learner and takes on considerable responsibility including mentoring undergraduates. Her recommendation letters focus not only on academic ability but also on admirable qualities including leadership, scientific imagination, and interest in new discoveries "rather than in secured established research". Such thinking outside of the box is to be commended.