Holger Kleinke

Full Professor

Department of Chemistry
University of Waterloo
Tel: 519-888-4567 ext. 33577
Email: kleinke@uwaterloo.ca
Website: http://kleinke.uwaterloo.ca

Research Interests:
Inorganic Materials, Solid State Chemistry, Thermoelectric Energy Conversion, Crystal Structure Predictions

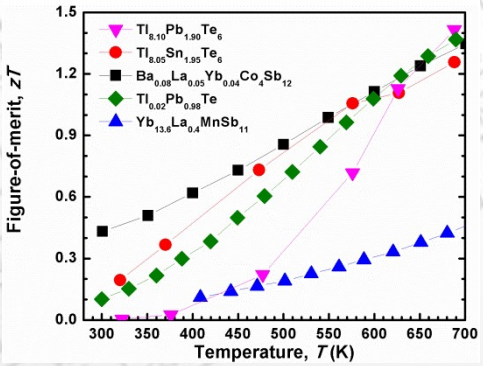
Academic Background:
Vordiplom, 1988, Chemistry, WWU Münster (Germany)

Diplom, 1991, Chemistry, WWU Münster (Germany)

Ph.D., 1994, Science, J.-G. Universität Mainz (Germany)

Habilitation, 2001, Inorg. Chem., Philipps-Universität Marburg (Germany)

Our main focus is on finding and optimizing new thermoelectric materials. Thermoelectrics are capable of converting heat into electrical energy and vice versa. This environmentally friendly energy conversion currently has several applications, but is limited by its low efficiency. We are attempting to increase the efficiency so that thermoelectrics may be used to recover electricity from the nowadays abundant waste heat, e.g. in the exhaust of automobiles.



One of our newest projects is to utilize Cu ion mobility to lower the thermal conductivity. This mobility has to be localized within each unit cell in order to inhibit Cu ion migration throughout the material, which would otherwise cause device degradation. Since the thermoelectric properties depend on the thermopower as well as on the electrical and thermal conductivity, various property measurements are routinely carried out in our group. The syntheses are guided by calculations performed by students who are fascinated by the theoretical aspects of chemical research.

Selected Awards:
Liebig Fellow, 1997-99 (Philipps-Universität Marburg)

Premier's Research Excellence Award, 2000

Canada Research Chair in Solid State Chemistry (tier II, NSERC), 2001

Ontario Distinguished Researcher Award (OIT), 2002.

Selected Publications:

• N. Farahi, S. Prabhudev, G. A. Botton, J. R. Salvador, H. Kleinke, *Nano- and microstructure engineering: an effective method for creating high efficiency magnesium silicide based thermoelectrics*, ACS Appl. Mater. Interfaces, in press (DOI: 10.1021/acsami.6b12297). • N. Nandihalli, Q. Guo, S. Gorsse, A. U. Khan, T. Mori, H. Kleinke, *Thermoelectric Properties of* $Ni_{0.05}Mo_3Sb_{5.4}Te_{1.6}$ *with Embedded SiC and* Al_2O_3 *Nanoparticles*, Eur. J. Inorg. Chem., 853 (2016). • N. Farahi, S. Prabhudev, M. Bugnet, G. Botton, J. Zhao, J. S. Tse, J. R. Salvador, H. Kleinke, *Enhanced figure of merit in* $Mg_2Si_{0.877}Ge_{0.1}Bi_{0.023}$*/multi wall carbon nanotube nanocomposites*, RSC Adv. **5**, 65328 (2015). • M. Oudah, K. M. Kleinke, H. Kleinke, *Thermoelectric Properties of the Quaternary Chalcogenides* $BaCu_{5.9}STe_6$ *and* $BaCu_{5.9}SeTe_6$, Inorg. Chem. **54**, 845 (2015). • Q. Guo, A. Assoud, H. Kleinke, *Improved Bulk Materials with Thermoelectric Figure-of-Merit > 1:* $Tl_{10-x}Sn_xTe_6$ *and* $Tl_{10-x}Pb_xTe_6$, Adv. Energy Mater. **4**, 1400348 (2014).