Seminar/Talk

Phonon channel engineering through crystal chemistry and defects

Dr. Matthias T. Agne
Dept. of Inorganic and Physical Chemistry, WWU Münster, Germany

Host: Maria Ibáñez

Phonon channel engineering through crystal chemistry and defectsIn the classic theory of thermal transport by atomic vibrations (phonons) in crystalline materials, heat moves in a manner analogous to a gas, described by a velocity and by scattering events. This is known as the phonon gas model. Thermal transport in amorphous materials is fundamentally different, where heat moves in a manner analogous to an atomic-scale random walk. These phonons can be called diffusons. Only recently have these two perspectives been unified within one theoretical framework, which subsequently shows that phonons in complex crystalline materials can exhibit both gas-like and diffuson-like character. Effective tuning of thermal conductivity thus requires an understanding of both transport “channels.” This talk will discuss materials design strategies in the context of two-channel transport. It will be shown that many ultralow thermal conductivity materials likely have both types of phonon transport, whose relative contributions depend strongly on temperature. Furthermore, factors like chemical composition and material defects may be used to prefer or suppress one channel or the other.

Monday, June 13, 2022 09:30am - 10:30am
Big Seminar Room B - Sunstone Building

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