Projects for Master, bachelor, and ARL students

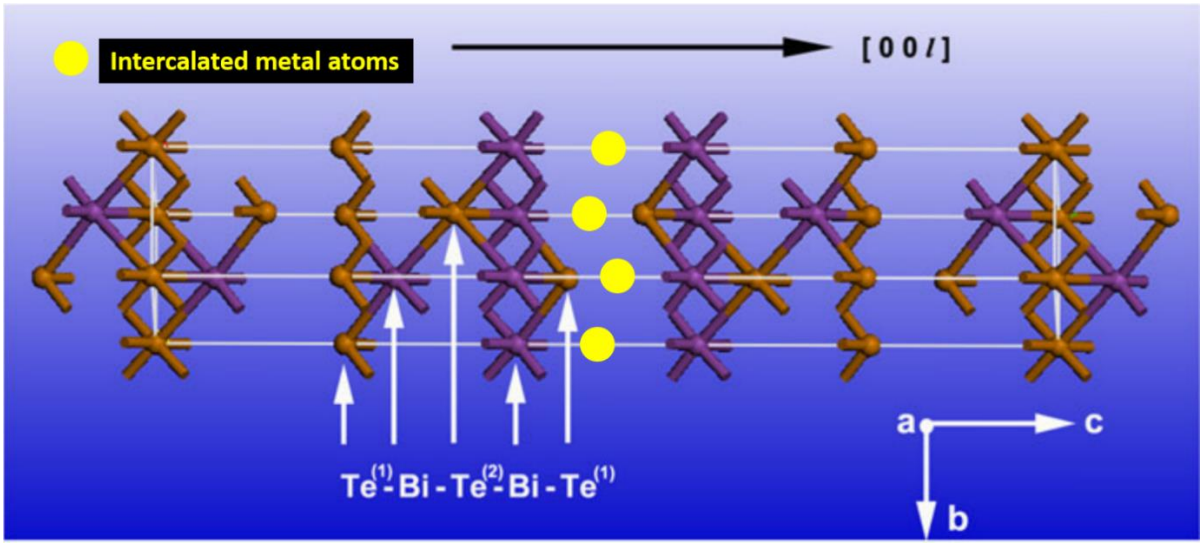
Intercalated Bi_2Te_3 based nanomaterials

Bi_2Te_3 compounds have been the most widely used traditional TE material in the temperature range of 200 – 400 K for a few decades. To make Bi_2Te_3-based devices more competitive in large-scale and high-power commercial applications, the *ZT* of Bi_2Te_3 materials must be improved significantly. Since the thermal and electrical transport properties are interrelated, it is very difficult to enhance one of them without sacrificing others. Intercalation can be a potential solution to decouple the interrelated thermoelectric properties.

This project aims to identify possible intercalation dopants for p- and n-type Bi_2Te_3 based materials. Your main task will focus on materials synthesis and structural characterization. The following topics can be offered:

1) transition metal interacted M-$Bi_2Te_{1-x}Se_x$ (M=Fe, Co, Ni, and Cu) (2 students)

2) transition metal intercalated M-$Bi_{0.5}Sb_{1.5}Te_3$ (M=Fe, Co, Ni, and Cu) (2 students)



Simultaneously optimizing Seebeck coefficient and electrical conductivity via intercalating metal atoms in Bi_2Te_3 based nanomaterials

References:

1. Chunlei Wan et al., Nature Materials, 14, 2015, 622–627.
2. Wenjie Xie et al., *Journal of Materials Science*, 48, 2013, 2745–2760.
3. Wenjie Xie et al., *Applied Physics Letters*, 101, 2012, 113902.
4. Wenjie Xie et al., *Nano Letters*, 10, 2010, 3283-3289.

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