

Crystal Growth and Properties of Emerging Quantum Materials

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In this contribution, I will focus on four families of materials, $\text{BaNi}_2(\text{As}_{1-x}\text{P}_x)_2$ [1], $\text{FeSe}_{1-x}\text{S}_x$ [2-3] $\text{Ta}_2(\text{Ni}_{1-x}\text{Co}_x)\text{Se}_5$ [4,5] and CsV_3Sb_5 [6], that show rich phase diagrams containing nearly degenerate electronic states. In these materials the electronic properties (e.g. nematicity, charge- and magnetic ordering) can be altered by tuning the interplay between the structural and electronic degrees of freedom, for instance by chemical doping or by applying hydrostatic pressure. The prerequisite for detailed experimental exploration, is the design and crystal growth of high-quality single crystals. We have been implementing chemical vapor transport and crystallization by flux for the growth of the selected materials as high-quality single crystals (see Fig. 1) and characterized these by chemical analysis, x-ray diffraction and magnetic measurements. I will explain the current experimental results and discuss promising future directions.

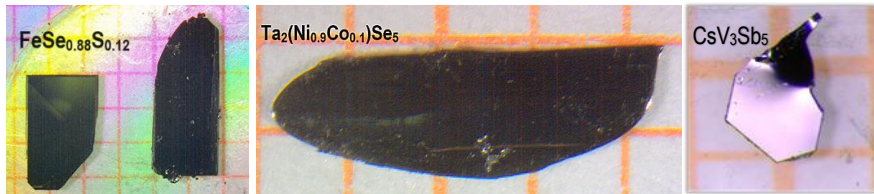


Figure 1: Single crystals of $\text{FeSe}_{0.88}\text{S}_{0.12}$, $\text{Ta}_2(\text{Ni}_{0.9}\text{Co}_{0.1})\text{Se}_5$ and CsV_3Sb_5 .

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