Crystal growth of MX_3 van-der-Waals materials

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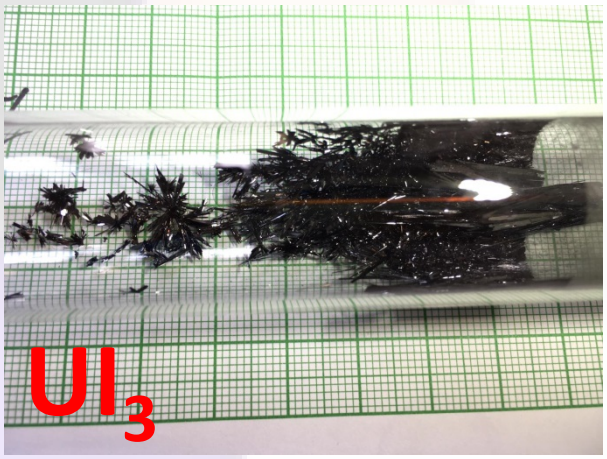
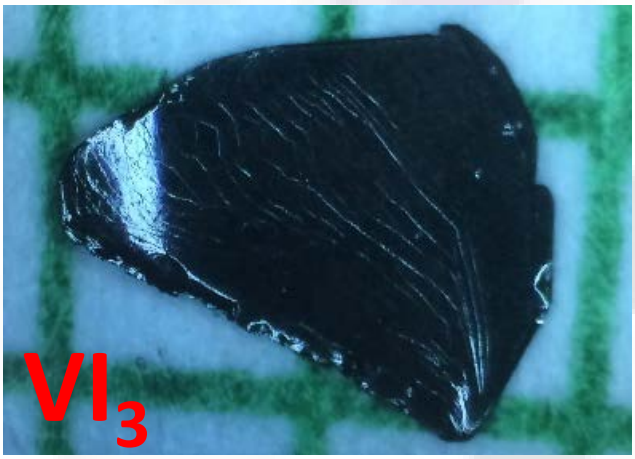
van der Waals (vdW) crystals are fascinating materials with potential for high-tech magnetic, magneto-electric and magneto-optic or spintronic applications. The early works in this field have mainly focused on creating magnetism in nonmagnetic 2D materials through various approaches, including defect implementation, surface functionalization, and doping control. In vdW halides of the compositions MX_2 and MX_3 where M is a transition metal cation and X is halogen anion, magnetism is naturally incorporated by choosing a transition metal with a partially filled d-shell. Magnetic vdW halides compose of two-dimensional (2D) layers bonded to one another through weak van der Waals interactions. These layers can be separated by cleaving down to atomic 2D single layer like graphene while preserve the magnetic order.

Targets of work

- Single crystal growth of new magnetic vdW materials by CVT method
- Verification of crystal structure and chemical composition of new materials
- Study of magnetic properties of new materials

Examples of already prepared single crystals by CVT method (UI_3 and VI_3).





Two possible crystal structures of vdW tri-halides, materials are often dimorphic.