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# TRANSITION METAL-BASED LAYERED VAN DER WAALS CHALCOGENIDES: EXPLORING MAGNETISM IN TWO DIMENSIONS

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Transition metal-based layered compounds with van der Waals (vdW) gaps between the structural layers are a rich source of magnetic materials for spintronic applications. Bulk crystals can be cleaved, providing high-quality two-dimensional nanomaterials, which are promising for the manipulation of spins in spintronic devices and low power quantum logic interfaces. In this contribution, Fe- and Mn-based $Fe_5AsTe_2$ [1], $NbFe_{1.3}Te_3$ [2], $FeAl_2S_4$ [3], $FeAl_2Se_4$ [4], $MnAl_2S_4$ [3], and $MnAl_2Se_4$ layered vdW materials will be presented. Crystal structures are probed by single-crystal and powder X-ray diffraction, and highresolution transmission electron microscopy. The listed compounds are built by atomically thin layers with the embedded transition metal atoms, which are terminated by vdW gaps. Crystal growth employing chemical vapor transport reactions yields bulk crystals (Fig. 1), which can be cleaved providing high-quality two-dimensional nanomaterials. Magnetization measurements reveal rich magnetic properties of the title chalcogenides, including bulk ferromagnetism, quasi-one-dimensional antiferromagnetism, spin-flop transitions, and low-temperature spin-glass behavior. This rich variety opens new ways of controlling spins in the cutting-edge spintronic technologies. The work is supported by the Russian Science Foundation, grant No. 21-73-10019.

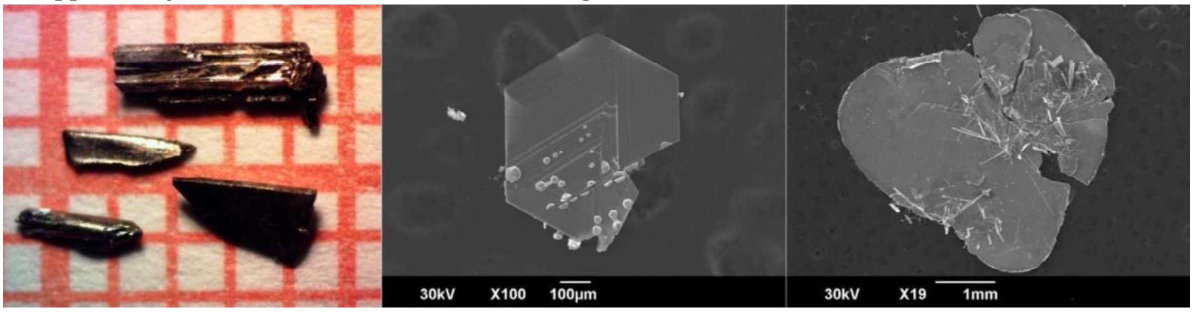


**Fig. 1:** Bulk crystals of the $NbFe_{1.3}Te_3$ (left), $FeAl_2S_4$ (middle), and $FeAl_2Se_4$ (right) layered van der Waals chalcogenides.

## References

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