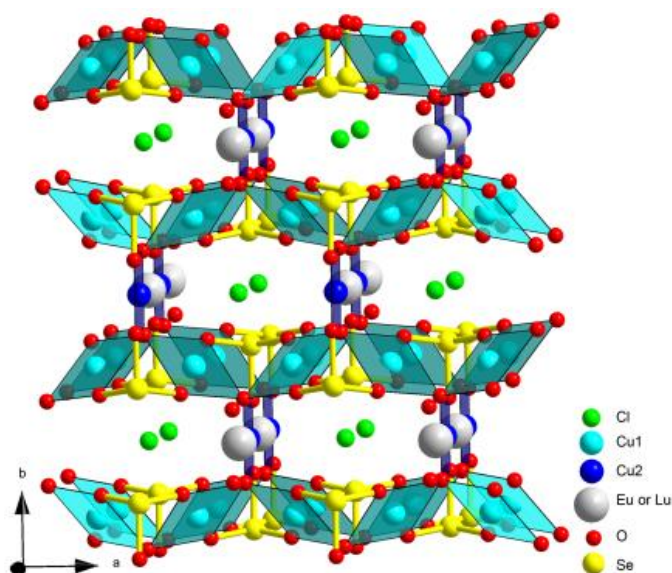


The physics of pristine and rare-earth substituted francisites

The multicomponent compounds with francisite structure $\text{Cu}_3\text{Bi}(\text{SeO}_3)_2\text{O}_2\text{Cl}$ constitute new versatile family of functional materials whose properties are largely



unexplored. The special feature of this structural type is an exceptional tolerance to the chemical substitutions. Thus, Se can be substituted by Te, Cl by Br, and Bi by any rare-earth element. These substitutions influence the stability of crystal structure. The pristine francisite experiences low temperature structural transformation at 120 K, while its Br counterpart does not. The basic magnetic parameters of francisites are quite stable. Independent of composition all these compounds

order antiferromagnetically in the range 20 – 40 K forming unique non-collinear six-sublattices structure. Under external magnetic field the francisites experience metamagnetic transformation into three-sublattices ferrimagnetic state. The magnetic network of francisite follows the buckled kagome motif with prevailing ferromagnetic interactions competing with antiferromagnetic ones. The proper description of magnetism in francisites demands taking into account Dzyaloshinskii-Moriya interactions. The presence of rare-earth ions in francisite structure adds new dimension to physics of these compounds. The interplay of rare-earth and transition metal anisotropies results in spin-reorientation phase transition below 10 K. Recent studies of high-frequency properties of francisite evidenced its superior characteristics for terahertz broadband filter devices.

