Anisotropic transport properties in bulk layered Cu_xTiS_2 compounds

E. Guilmeau, M. Beaumale, Y. Bréard, S. Hébert, D. Chateigner, and A. Maignan

Crystallographic orientation and anisotropic transport properties on textured Cu_xTiS_2 bulk compounds (x=0, 0.02, 0.05, 0.1) were investigated for better understanding and further improvement of the high-efficiency n-type sulfide materials. Textured ceramics were prepared by spark plasma sintering (SPS), in which plate-like grains are weakly aligned with their average *ab*-planes perpendicular to the pressure direction. Curved position-sensitive detectors coupled to a tilt-angle scan enabled the treatment of the whole X-ray diffraction (XRD) pattern using the combined Rietveld–WIMV–Popa algorithm. The complete XRD texture analysis revealed that SPS induces a maximum of orientation distribution of 3.6 m.r.d, as observed on the (001) inverse pole figure. A comparative study of the thermoelectric properties addressed the effect of anisotropy on the electrical conductivity (σ), Seebeck coefficient (S) and thermal conductivity (κ). Interestingly, the magnitudes of σ, S and κ are reduced along the *c*-axis, as compared to the *in*-plane direction. The final ZT values remain almost independent of the measuring direction, ranging from 0.15 (RT) to 0.45 (800K) for x=0.02 composition.