Magnetic interactions in Bergman-type *i*-Zn–Mg–Tm quasicrystals

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Recently, new Bergman-type icosahedral quasicrystalline phases were synthesized in the Zn–Mg–Tm system using the self-flux method [1]. We will report on the investigation of the magnetic properties of the primitive (P-type) and face-centered (F-type) phases using single crystals of approximately 1 mm size, which displayed well-defined pentagonal faces in the F-type and rhombic faces in the P-type. Scanning electron microscopy, combined with EDS mapping confirmed the high quality of the samples, showing minimal precipitates, and allowed us to determine the chemical compositions as $Zn_{69.7}Mg_{21.5}Tm_{8.8}$ for the P-type and $Zn_{62.0}Mg_{28.8}Tm_{9.2}$ for the F-type. Temperature-dependent magnetization measurements revealed paramagnetic behavior down to 1 K. Below 1 K, the F-type exhibited a splitting between the zero-field-cooled (ZFC) and field-cooled (FC) magnetization, with the ZFC magnetization displaying a cusp, indicative of spin-glass-like behavior. In contrast, the P-type showed no splitting. The specific heat exhibits a peak that broadens and shifts with increasing magnetic field, likely due to the Schottky effect [2].

References:

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