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Magnetic frustration in rare earth zirconate pyrochlores

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Pyrochlore oxides, A2B2O7 (where A = Rare Earth, B = Transition Metal) are one of the most studied and puzzling classes of materials, due to their particular crystallographic structure (both A and B sites form a 3D network or corner-sharing tetrahedra) and exotic magnetic properties, such as spin ice, spin glass, spin liquid behaviour or long-range magnetic ordered states. Recent advances in the crystal growth by the floating zone method of pyrochlore oxides with high melting temperatures [1] have motivated us to embark upon a study of the zirconate pyrochlore series, A2Zr2O7 (with A= La, Pr, Nd, Sm, Gd) [2]. We discuss briefly the challenges associated with the synthesis of large high quality crystals of the zirconate pyrochlores and present the results of the structural investigations carried out using both powder and single crystal X-ray and neutron diffraction [3]. Magnetic susceptibility measurements have also been carried out to determine the magnetic properties of these materials [3]. We present a detailed structural and magnetic study of this class of frustrated pyrochlore magnets with emphasis on their fascinating magnetic behaviours.

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