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An insight into the local structure and dynamics of A2Zr2O7

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$A_2Zr_2O_7$ oxides have been studied partially because of their possible use in the storage of nuclear waste (1) or as a photochemical catalyst materials (2). The overall $A_2Zr_2O_7$ structure is cubic (of pyrochlore type for light rare earth, defect-fluorite type for heavy rare earth ones). The pyrochlore zirconates are thoroughly investigated quantum spin ice candidates, whereas heavy rare earth zirconates remains understudies - high temperature and specially application focused studies have been reported. The material behaviour important for the upper mentioned applications strongly depends on the actual crystal structure. We present the results on (i) bulk properties of an $Er_2Zr_2O_7$ single crystal investigated by means of specific heat, magnetization and AC susceptibility, all revealing a glass-like anomaly at 2 K. (ii) the microscopic properties investigated by total neutron scattering. The pair distribution function shows the deviation from the long-range defect-fluorite structure. (iii) the muon spin rotation spectroscopy performed to reveal the nature of anticipated spin glass state at low temperature showing persisting strong spin dynamics not consistent with classical spin-glass systems. The results are discussed in a wider context of frustrated and magnetically diluted systems.

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