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Quantum spin state in a spin-1/2 breathing pyrochlore antiferromagnet KENTA KIMURA, Osaka University, SATORU NAKATSUJI, The University of Tokyo, TSUYOSHI KIMURA, Osaka University — A pyrochlore lattice antiferromagnet consisting of corner-sharing tetrahedra of magnetic ions has attracted much attention because the inherent geometrical frustration often leads to exotic magnetism such as quantum spin liquid [1]. The key building unit of pyrochlore magnet is a single spin tetrahedron. Thus, a material composed of a spin-tetrahedral unit is expected to provide important insights on physics of full pyrochlore lattice. Moreover, it may show exotic magnetism based on the unique properties of the single tetrahedron associated with the spin chirality. However, no spin-1/2 regular tetrahedral system has been reported to date. In this study, we report the characterization of a new Yb-based material Ba3Yb2Zn5O11 [2]. This material is identified as a model system of a pseudospin-1/2 quantum antiferromagnet on breathing pyrochlore lattice characterized by an alternating array of small and large Yb tetrahedra. Despite antiferromagnetic interactions J $\sim$ 7 K, a large amount of magnetic entropy (25%) remains at 0.38 K, indicating that each small Yb tetrahedron forms a unique doubly degenerate singlet state.

[1] B. Canals and C. Lacroix, Phys. Rev. Lett., 80, 2933 (1998)
[2] K. Kimura, S. Nakatsuji, and T. Kimura, Phys. Rev. B, 90, 060414(R) (2014).

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