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Molecular quantum magnetism with strong spin-orbit coupling in inorganic solid $Ba_3Yb_2Zn_5O_{11}$ SANG-YOUN PARK, SUNGDAE JI, JAE-HOON PARK, MPPC-CPM, Pohang Univ of Sci Tech, SEUNGHWAN DO, KWANG-YONG CHOI, Dept. of Physics, Chung-Ang University, DONGJIN JANG, BURKHARD SCHMIDT, MANUEL BRANDO, Max Planck Institute for Chemical Physics of Solids, NICHOLAS BUTCH, NIST Center for Neutron Research — The molecular magnet, assembly of finite number of spins which are isolated from environment, is a model system to study the quantum information process such as the qubit or spintronic devices. In past decades, the molecular magnet has been mostly realized in organic material, however, it has difficulty synthesizing materials or controlling their properties, meanwhile tremendous endeavors to search inorganic molecular magnet are continuing. Here, we propose $Ba_3Yb_2Zn_5O_{11}$ as a candidate of inorganic molecular magnet. This material consists of an alternating 3D-array of small and large tetrahedron containing antiferromagnetically coupled four pseudospin-1/2 Yb ions, and magnetic properties are described by an isolated tetrahedron without long-range magnetic ordering. Inelastic neutron scattering measurement with external magnetic field reveals that extraordinarily huge Dzyaloshinsky-Moriya (DM) interaction originating from strong spin-orbit coupling in Yb isospin is the key to explain energy level of tetrahedron in addition to Heisenberg exchange interaction and Zeeman effect. Magnetization measurement shows the Landau-Zener transition between avoided crossing levels caused by DM interaction.

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