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Supersolids and Anomalous Hysteresis in Frustrated Spin-Dimer Systems DAISUKE YAMAMOTO, RIKEN, IPPEI DANSHITA, YITP — We study the ground-state properties of weakly coupled spin dimers on a triangular lattice. The competition of the two (direct and crossed) interdimer interactions and the geometry of the triangular lattice lead to a strong frustration. By using a large-size cluster mean-field method and the cluster-size scaling, we determine the quantitative magnetic phase diagram of the system under the presence of a magnetic field. The strong intradimer interaction provides a gapped spin-singlet ground state. If the magnetic field exceeds a certain critical value, the system undergoes a phase transition to a magnetically ordered state, which is known as a Bose-Einstein condensation (BEC) of spin-triplet excitations called "triplons." We find that for strong magnetic fields, the magnetization curve shows plateaus at 1/3 and 2/3 of the total magnetization, in which the local singlet and triplet states form a superlattice pattern. This state can be regarded as a solid of triplons. We also find that if increasing (decreasing) the magnetic field from the 1/3 (2/3) plateau, the BEC of triplons occurs on the superlattice background, leading to the transition into "magnon supersolid" phase. The region of supersolid phase in the phase diagram is reasonably large compared to the square-lattice case.

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