Magnetic and thermal properties of $TbAl_3(BO_3)_4$ borate down to 140 mK

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Specific heat of a trigonal $TbAl_3(BO_3)_4$ single crystal was measured between 0.14 and 300 K. At $T_C = (0.678 \pm 0.002)$K, a second order phase transition, accompanied by a λ-type anomaly, was discovered. It was interpreted as being related to the appearance of a long range magnetic (probably antiferromagnetic) order of Tb^{3+} magnetic moments. Studies of the influence of magnetic field (up to 1 T) applied along the trigonal axis on the transition and on the specific heat, aimed at determining the kind of magnetic order and explaining whether the transition has a classical or a quantum character, were performed. Lowering the transition temperature, damping the anomaly, and appearance of the Schottky anomaly (related to excitations of the Tb^{3+} ions) were observed with increase of the field.

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