Thermal properties of antiferromagnetic zigzag chain system β-TeVO$_4$

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Specific heat of a β-TeVO$_4$ single crystal was measured by using a PPMS (Quantum Design) in the temperature range 0.1-300 K, in the magnetic field, H, ranging from 0 to 9 T. Both a magnetic and a non-magnetic contribution to the specific heat $C_P(T)$ of β-TeVO$_4$ were separated and analyzed. The model of 1D antiferromagnetic Heisenberg $S=\frac{1}{2}$ spin chains was found to describe satisfactorily the magnetic contribution. Three specific heat anomalies, appearing at $T = 2.28\pm0.02$, 3.28 ± 0.02, and 4.65 ± 0.02 K ($H = 0$ T), have been detected. In order to study the field dependences of these anomalies, $C_P(T)$ was measured at several fixed values of the magnetic field oriented parallel and perpendicular to the crystallographic b-axis. As the result, the magnetic H-T phase diagrams of β-TeVO$_4$, for $H||b$ and $H\perp b$, were constructed.