Magnetocaloric effect of Gd$_5$Si$_4$ – influence of mechanical milling

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The magnetic susceptibility, magnetization curves, heat capacity, and magnetocaloric effect (MCE) measurements are reported both for the bulk and mechanically milled Gd$_5$Si$_4$ compound. X-ray diffraction studies show that already the milling time of 10 hours is enough to destroy the crystallographic order. Simultaneously, the magnetic phase transition at 340 K is strongly suppressed implying a breaking of the long-range magnetic order. For the bulk sample the maximum isothermal magnetic entropy change is equal to 6.1 J. kg$^{-1}$K$^{-1}$ at the magnetic field change of 9 T, whereas it is negligible after the milling. The temperature dependence of the specific heat confirms the presence of the transition at $T_C = 340$ K for the bulk sample.