Transport and magnetic properties of highly densified CoS2 ceramic.

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Dense ceramics of the itinerant ferromagnet CoS2 have been prepared by the spark plasma sintering technique. The structural study confirms a cubic unit-cell for CoS2 with a = 5.539(6) Å (SG Pm3m). Scanning and transmission electron microscopy reveal the existence of sulfur deficient regions of composition “Co2S3” with a structure compatible to that of CoS2 where 0.5 S atom are missing in one o of two successive layers along the b direction. The volume of these regions estimated to be less than 1% is explained by possible S losses from the surface during the sintering. The physical properties measurements show a high TC (122 K), large saturated magnetization (0.88 lB/f.u.), with a _100% magnetoresistance at 5K in 9 T. Also, the value of the residual resistivity ratio, q300K/q5K¼45, between those of crystal and conventional ceramics, attest for both good compacity and grain connectivity. Interestingly, the Seebeck coefficient exhibits negative values reaching $S$ _47.5 lV K _1 at 675K and below TC, S can be fitted by a diffusion model with a magnon term related to the ferromagnetism. A large power factor ($S^2/q$) of 1mWm _1 K _2 is obtained over a broad T range but the too high thermal conductivity (j675 K _ 8.7W K _1 m _1) is a limiting physical parameter to use CoS2 ceramics inthermoelectric devices. VC 2013 AIP Publishing LLC.

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