

## **The magnetocaloric effect in rare - earth based micro and nanostructures**

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The rare-earth elements exhibit the large total angular momentum  $J$  of all magnetic metal and they are best candidate to reach highest magnetocaloric effect (MCE) [1]. In [2], the experimental value of magnetic moment was found strongly depending on Holmium structure and crystallographic orientations. The magnitude of the magnetocaloric effect and the magnitude of the magnetic cold capacity are influenced not only by the purity of the material, but also by microstrains, nanostructuring, internal microstresses, orientation of the substrate on which multilayer structures are grown, etc .

The observed decrease of the magnetic entropy variation when moving from microwires to heterostructures is associated to the decrease in the magnetic moment per Gd atom observed for the W/Gd/W/MgO structures. Variation of the internal stresses causes variation of orbital moment in Gd<sup>3+</sup> ions. On the other hand, in Gd microwires extracted by ultrafast cooling of the melt a change in the magnetic entropy as high as 12 J/kg K was found at a Curie temperature of 293 K in a magnetic field of 5 T. Closeness of the temperature of magnetic phase transition to room temperature makes Gd films convenient for local temperature control in microsized devices.