

Role of Fe-ions in the formation of magnetic and thermomagnetic properties of quasi-binary $\text{Ho}(\text{Co}_{1-x}\text{Fe}_x)_2$ compounds

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Structure, magnetic and thermomagnetic properties of the $\text{Ho}(\text{Co}_{1-x}\text{Fe}_x)_2$ alloy ($x = 0.09, 0.12, 0.13$) as a perspective material for thermomagnetic machine have been investigated. Magnetic properties were measured by SQUID-magnetometer under the field up to 7 T at temperature varied from 4.2 to 350 K. Curie temperature (T_c) is equal to 199, 258, and 271 K, respectively. Temperature dependencies of the magnetic entropy change $\Delta S(T)$, which were calculated from magnetization isotherms, demonstrated broadening of the maximum at temperatures below T_c both under increasing magnetic field and under increasing of iron concentration. For $\text{Ho}(\text{Co}_{0.88}\text{Fe}_{0.12})_2$ compound the RCP [1] value measured at 5 T exceed the RCP value observed for $\text{Tb}(\text{Co}_{0.7}\text{Fe}_{0.3})_2$ [1] (490 J/kg vs. 299 J/kg, respectively). According to our results, $\text{Ho}(\text{Co}_{1-x}\text{Fe}_x)_2$ alloys exhibit large magnetocaloric effect and can be considered as a promising material for both applied and basic prospective research.

References:

[1] Madhumita Halder, S. M. Yusuf, M. D. Mukadam, et al., Phys. Rev. B 81 (2010) 174402