Homogeneity ranges Y_2Co_{17} - YCo_5 in the Y-Co-Al system and their magnetic properties

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The solid solution $Y_{1-x}(Co,Al)_{5+2x}$ has been studied by X-ray powder diffraction. The alloys were prepared from pure metals by arc melting, and annealed for 2 weeks at 873 K. Their crystal structures belong to the closely related structure types Th_2Ni_{17} (space group $P6_3/mmc$) and $CaCu_5$ ($P6/mmm$). Substitution of Co by Al in the Y_2Co_{17} and YCo_5 compounds may reach 10 and 25 at.%, respectively. The *a* and *c* parameters of the $Y_2Co_{17-x}Al_x$ compounds increase with the increasing of Al content along the lines at 10.5 at.% Y. The solubility of Al in YCo_5 leads to the increasing of *a* and *c* parameters. In the system Y-Co-Al, the Y-content in the solid solutions along the lines with 5 at.% Al changes from 9.0 to 16.7 at.%. Within this range a transition from a Th_2Ni_{17}-type structure to a $CaCu_5$-type structure was observed.

Thermo-magnetic curves were measured on a SQUID magnetometer and by Faraday's weighting method. The magnetic susceptibility was recorded in the temperature range 1.9 - 1073 K and at the magnetic fields 0 - 5 T. The results show that the progressive replacement of Co atoms by Al atoms in the $Y_2Co_{17-x}Al_x$ and $YCo_{5-x}Al_x$ compounds is accompanied by loses of their ferromagnetism and they become paramagnetics at room temperature. Both, the Co saturation magnetic moment and Curie temperature of these phases are decreased versus the aluminum content.

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