GIANT MAGNETORESISTANCE IN MELT-SPUN Co-Cu MODIFIED BY RARE EARTHS

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9.7 cm

We present results on the modification of the giant magnetoresistance effect (GMR) in granular Co–Cu alloys. The samples of the composition $RE_xCo_{20}Cu_{80-x}$, RE = Sm, Gd or Dy (x=0, 1 and 3) were produced by melt–spinning and subsequent annealing. The magnetoresistance $MR = [R(H) - R(0)]/R(0)$ is negative as in granular Co-Cu, but its values depend on the kind of rare earth element added and on changes in the microstructure induced by thermal treatment. The highest MR was achieved upon annealing at 450–480^{o}C for 1h. An addition of 1 at.% rare earth metal yields a considerable increase of MR compared to $Co_{20}Cu_{80}$, whereas an addition of 3 at.% causes a decrease of this value. E.g., by addition of 1 at.% RE=Dy to $Co_{20}Cu_{80}$ and optimum thermal treatment of the alloys, the value of MR measured at 10 K increases from 15% to 28%. The MR ratio measured at 10 K for a ribbon with RE=Dy and x=1 does not reach saturation even in fields up to 16 T. The effects can be attributed to the presence of hexagonal $Dy(Co,Cu)_5$ clusters, which was ascertained from X–ray diffraction data, and/or cubic $DyCu_5$ besides fcc Co grains and diluted Co or RE atoms in the Cu matrix.

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