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Microstructure of low cobalt FeCrCo hard magnet alloys

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The alloys of system Fe-Cr-Co concern to group hard magnetic materials of dispersion-hardening class. Most investigated are the alloys with the high contents cobalt-30Cr23Co and 25Cr15Co ensuring rather high magnetic properties. The magnets from them receive mainly by methods of molding as application of methods of processing by pressure is complicated in connection with low strain ability caused by formation in structure embrittle intermetallic σ phase. The alloys with the low contents cobalt remain insufficiently known because of a low level of magnetic properties at usual modes of thermomagnetic processing and tempering (TMPT). At the same time these alloys have a number of advantages major of which together with economy cobalt is open α single-phase area. This feature of alloys with the low contents cobalt alloys to avoid realization high-temperature quenching on α solid solution before TMPT, i.e. there is an opportunity to carry out TMPT after thermomechanical treatment without heating half-finished product to high temperatures. Such circuit of processing allows to keep the small size of grains α-phase received at thermomechanical processing and raises a complex of mechanical properties of ready magnets. The necessary level of magnetic properties in an alloy is reached at the expense of optimization of a mode TMPT.

The results of X-ray diffraction analysis of phase structure of an alloy 28Cr8Co have confirmed that in an interval of temperatures 700－1000℃ about an alloy is single-phase. The results of electron-microscope investigation of foils cut out from a sample of an alloy subjected TMPT on an optimum mode has revealed characteristic for alloys Fe-Cr-Co modulated structure consisting from particles lengthened in direction of a field of magnetic phase in a not magnetic matrix.

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