INFLUENCE OF COMPOSITION ON HYPERFINE INTERACTIONS IN FeMoCuB NANOCRYSTALLINE ALLOY

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Influence of varying Fe/B ratio upon hyperfine interactions is investigated in the $Fe_{91-x}Mo_8Cu_1B_x$ rapidly quenched alloy. The latter is studied both in the as-quenched (amorphous) state as well as after one-hour annealing at different temperatures ranging from 330 ^oC up to 650 ^oC. Such heat treatment causes significant structural changes featuring formation of nanocrystalline bcc-Fe grains during the first crystallization step. At higher annealing, grain-growth of bcc-Fe and occurrence of additional crystalline phases is observed. Relative fraction of crystalline phase governs the development of magnetic hyperfine fields in the residual amorphous matrix even if this was fully paramagnetic in the as-quenched state. The development of hyperfine interactions is discussed as a function of annealing temperature and composition of the measured alloys. ^{57}Fe Mössbauer spectrometry was used as a principal analytical method. Additional information related to structural arrangement is obtained from X-ray diffractometry. It is shown that in the as-quenched state the relative fraction of magnetic hyperfine interactions increases as the amount of B rises. In partially crystalline samples, the contribution of magnetic hyperfine interactions inside the retained amorphous matrix increases with annealing temperature even though the relative fraction of amorphous magnetic regions decreases.

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