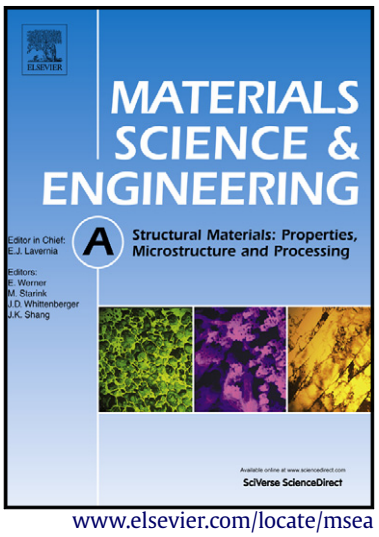

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On the remarkable thermal stability of nanocrystalline cobalt via alloying

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Abstract

Nanostructured Co materials are produced by severe plastic deformation via alloying with small amounts of C and larger amounts of Cu. The thermal stability of the different nanostructured Co materials is studied through isothermal annealing at different temperatures for various times and compared to the stability of severe plastically deformed high-purity nanocrystalline Co. The microstructural changes taking place during annealing are evaluated by scanning electron microscopy, transmission electron microscopy and microhardness measurements. In the present work it is shown that the least stable nanostructured material is the single-phase high purity Co. Alloying with C improves the thermal stability to a certain extent. A remarkable thermal stability is achieved by alloying Co with Cu resulting in stabilized nanostructures even after annealing for long times at high temperatures. The essential reason for the enhanced thermal stability is to be found in the immiscibility of both components of the alloy.

Keywords

Nanostructured materials; severe plastic deformation; thermal stability; cobalt