Nanoscale physics

Influence of the deuterium ion irradiation on Ni magnetic properties and structure

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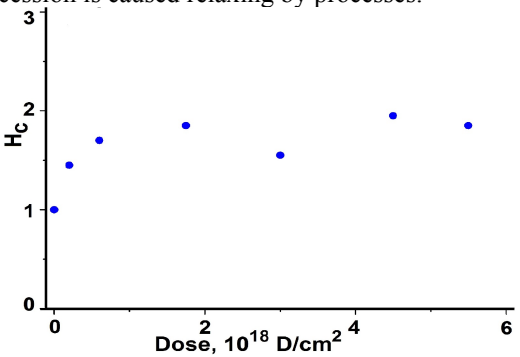
Magnetic properties ferromagnetic depend on deficiency of a crystal structure. In this work magnetic properties (H_c) of nickel have been investigated on the samples preliminary irradiated with ions deuterium by energy 12 keV in the dose range from 1×10^{17} to 5×10^{18} D/cm^2 at temperature 80 K.

Investigation TEM have shown that as a result of bombardment deuterium in nickel crystal structure there are extended areas of elastic distortions (in pictures it bending contours) as consequence of synchronous shift of atoms from equilibrium positions in planes of easy sliding. Such areas can be classified as cascades of displacement, relaxing by occurrence of walls of the dispositions with the same name. In the course of increase irradiation doses the increase in H_c in 1.7 times is observed. In the range of doses 2-3 $\times 10^{18}$ D/cm^2 reduction of H_c by 20 % is observed. This recession is caused relaxing by processes.



The further increase in a dose leads again to increase in H_c and defect accumulation. Thus, it is possible to assert that the structure irradiated nickel is caused by the following interconnected processes: radiating defect accumulation, an exchange of energy between flying particles and electron lattices, a relaxation of elastic distortions. Set of these processes causes development radiation-induced diffusions, streamlining, aggregation, formation of local structures, amortization, crack formation.