Nanostructured surfaces

Deuterium concentrations in austenitic stainless steel by deuterium irradiation. Effects dose and temperature irradiation

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The kinetics of structural transformation development in the austenitic stainless steel was traced from deuterium thermodesorption spectra, TEM as a function of deuterium concentration and temperatures irradiation. The samples were pre-implanted with 12 keV deuterium ions in the dose range from 8×10^{14} to 2.7×10^{18} D/cm^2 at the different irradiation temperatures: 100, 240, 295, 380, 420 and 600 K.

Temperature 100 K. The maximum attainable concentration of deuterium in steel is C=1 (at.D/at.met.=1/1). At C≥0.5, two hydride phases are formed in the steel, the decay temperatures of which are 240 K and 275 K. The hydride phases are formed in the bcc structure resulting from the martensitic structural transformation in steel.

Temperature 295 K. The medium-dose region is characterized by radiationinduced action on the steel in the presence of hydrogen. The process results in the formation of the energy-stable crystalline nanostructure of steel, having a developed network of intercrystalline boundaries. The basis for this developed network of intercrystalline boundaries is provided by the amorphous state. The total concentration of the accumulated deuterium in the region of medium implantation doses makes 7 to 8 at.%.

Temperature 380; 420; 600 K. In a deuterium thermodesorption spectras the extended area desorption deuterium in a range of temperatures 450-900 K, caused by formation of local structural in radiationinduced a layer is observed. Formation of local structural can be caused a segregation a steel component, in the course of implantation deuterium (radiating influence local structural at presence deuterium). The total concentration of the accumulated deuterium in the region of medium implantation doses makes 1 to 3 at.%.