DEFORMATION EFFECT ON STRUCTURE AND PROPERTIES OF SURFACE LAYERS IN IRON ALLOYS UNDER NITROGEN AND CARBON ALLOYING

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The aim of this work was to study the effect of plastic deformation (0 - 70%) on the structure, chemical and phase composition, mechanical properties of surface layers formed in iron and iron-based alloys under alloying by nitrogen and carbon in ammonia and propane-butane environment with various ratios gaseous components at 853 K during 0.5-6 hours. Obtained surface layers were studied by means of X-ray diffraction, electron probe analysis, Auger-electron spectroscopy, microhardness and wear resistance tests. It was established that the surface layer after nitrogen and carbon saturation consists of epsilon-phase with the hexagonal closed packed crystal structure or theta-phase. The transition was revealed in the layer after such (25 - 30%) deformation and saturation in gas mixture of 90% ammonia and 10% propane-butane. Obtained in this way layers show maximum microhardness, wear resistance and depth. The epsilon-phase was found in the alloy after deformation out of the 25 - 30% ranges. The lattice period of the alpha-phase containing nitrogen and carbon decreases non-linearly within the 25 - 40% degree of plastic deformation. We assume that high mechanical properties of the surface layers results from participation of disperse carbonitrides on such crystal lattice defects as dislocations.

Keywords: SURFACE LAYER, STRUCTURE, DEFORMATION

POLYTYPES AND STRUCTURAL TRANSITION IN CALCIC ALUMINATES HYDRATED \([\text{Ca}_2\text{Al(OH)}_6]^{\pm}[\text{X},2\text{H}_2\text{O}]^{-}\) WITH X = Cl, Br AND I

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The compounds presented in the title were studied as a function of temperature, by X-Ray Diffraction on powder with high resolution (radiation synchrotron), on single crystal, by Differential Scanning Calorimetry (DSC) and by optical polarized light microscopy. These lamellar double hydroxides (LDH) compounds are made up of rigid layers positively charged in which Ca\textsuperscript{2+} and Al\textsuperscript{3+} are ordered. According to the nature of halide X, inserted anion which allow the re-establishment of the electroneutrality, one or two polytypes were identified: X = Cl (polytype 6R (Space Groups-R 3c)); X = I (polytype 3R (SG=R-3c)), X = Br (polytypes 6R and 3R). Structure transformations occur at a temperature Ts which depends on the nature of halide: Ts(Cl) = 35°C, Ts(Br) = -40°C and Ts(I) = -150°C. These transitions are accompanied by a lowering of symmetry from a high temperature to a low temperature phase according to: from R-3c to C2/c and from R-3 to P-1. The origin of the transition is due to the ordering of the network of hydrogen bonds Cl—H in the inter lamellar part of the structure. The transition leads to a displacement up to 0.5Å of the inserted species H\textsubscript{2}O and X. The transition is narrowly correlated to the hydration enthalpy of the anions X. The study of the solid solution \([\text{Ca}_2\text{Al(OH)}_6]^{\pm}[\text{Cl},\text{Br},2\text{H}_2\text{O}]^{-}\), with x varying from 0 to 1, confirms these results.

Keywords: PHASE TRANSITION LAMELLAR DOUBLE HYDROXIDES CRYSTAL STRUCTURE