SMALL ANGLE SCATTERING OF NEUTRON IN IRON-BASE FCC ALLOYS DOPED WITH CARBON OR NITROGEN

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Iron-base FCC alloys (Fe–18Cr–16Ni–10Mn, Fe–18Cr–16Ni) additionally alloyed with carbon or nitrogen were studied by means of small-angle scattering of thermal polarized neutrons [1]. It is found an opposite influence of carbon and nitrogen on values of neutron scattering. Namely, with increasing carbon content both cross section of small sngle neutron scattering in the range $5 \cdot 10^{-3} \leq q \leq 5 \cdot 10^{-2}$ (SANS) and total cross section (S_{tot}) drastically arise while the increasing nitrogen content leads to decreasing S_{tot} (Fig.). The significant influence of the Mn presence in alloy on neutron scattering intencity was found. The contron of polarization of both transmitted and scattered neutrons shows that one can neglect the magnetic scattering cross section in comparison with the nuclear one. Consequently, S_{tot} characterizes a system of nuclear inhomogeneities in alloys.

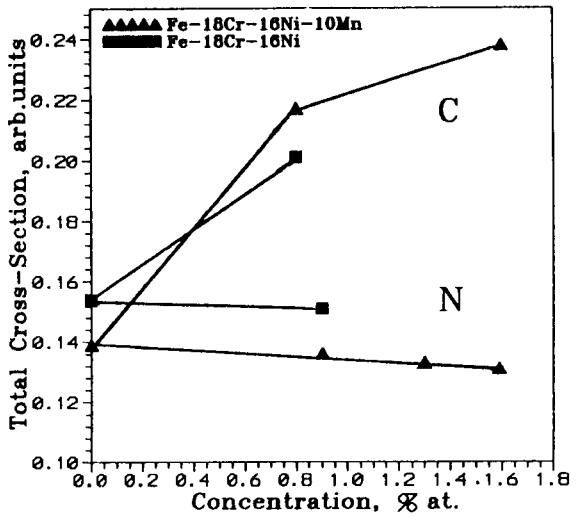

Fig. Total cross section dependence of austenitic alloys 18Cr16Ni and 18Cr16Ni10Mn on concentration of carbon and nitrogen

The data obtained were interpreted as follows. Carbon alloying of iron-base FCC alloys results in increasing of chemical inhomogeneity on a scale exceeding the lattice parameter, while nitrogen allowing improves a homogeneity of the solid solution. The comparison of experiments with alloys doped with Mn and Mn free alloys has found the special role of Mn as contrasting element in Fe-based FCC alloys for neutron scattering. So this data corroborates the supposition on increasing of nuclear inhomogenity in alloys doped with carbon.

REFERENCE

1. *Grigoriev S.V., Gubin O.A., Kopitsa G.P., Okorokov A.I., Runov V.V., Balanyuk A.G., Gavriljuk V.G., Sozinov A.L.* Small Angle Scattering of Neutron in Iron-Base CrNiMn FCC Alloys Doped with Carbon or Nitrogen., Preprint PNPI-2048. Gatchina. 1995. 13 p.