HYDROGEN-CONTAINING METAL-CARBON DISPERSED COMPLEXES

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Introduction

Sorption properties of nanostructural materials greatly depend on their purity and consequently the technology of their production. Investigation of gas evolution from nanomaterials in ultrahigh vacuum allows us to elucidate the effect of interstitial impurities on sorption properties of nanomaterials, to conduct purification by annealing at high temperatures, improve and stabilize sorption, emission and other properties.

Investigation of gas evolution from nanomaterials has been performed in the ultrahigh vacuum setup (P_{res} ~ 10^{-7} Pa) using the mass- spectrometer MX-7304. In heating the samples studied the working vacuum was $1 \cdot 10^{-5}$ - $2 \cdot 10^{-6}$ Pa. Dispersed powders of Ni, $LaNi_5$ composites produced by the electric erosion method in alcohol cooled by liquid nitrogen to its freezing point (~ -110°C) have been studied.

Investigation of gas evolution from the sample of dispersed powders has been performed
in a temperature range of 20-800°C with the continuous increase in temperature at a rate of 2-3 °C/s.

Results and discussion

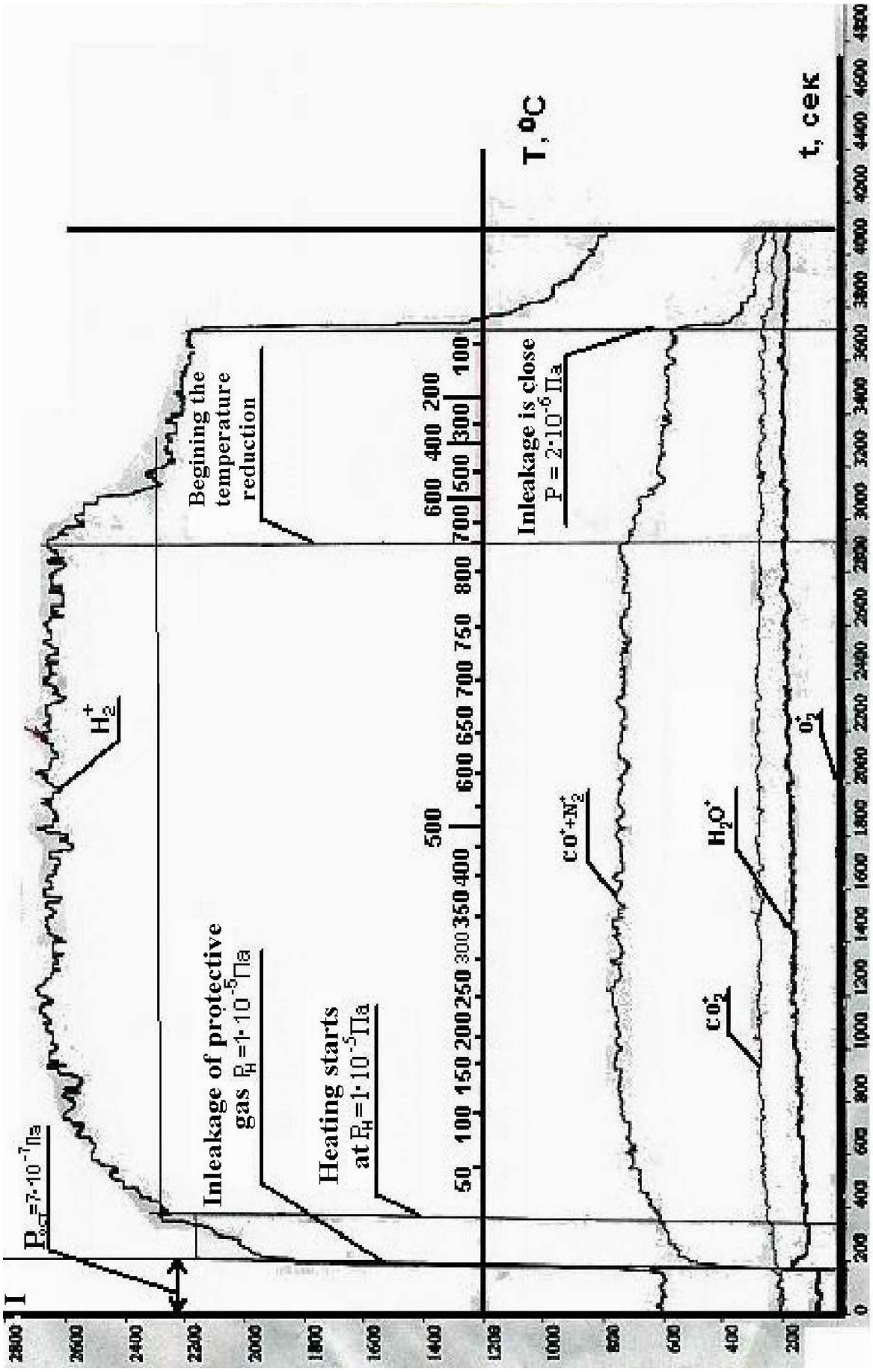
Analysis of recorded mass spectra (Fig.1) has shown the presence of large amounts of H_2 (2 at.m.), much less CO+N_2 (28), CO_2 (44), H_2O (18) and small amounts of hydrocarbon compounds C_nH_m (15, 16). The relation of peak intensities in mass spectra changes in heating. Maximum gas evolution by hydrogen is observed at 250-400°C. Evolution of gaseous impurities changes considerably in repeated heating the samples.

Conclusions

Investigation of gas evolution from dispersed composites has shown that Ni and $LaNi_5$ powders contain considerable amounts of organic liquid in use and different gases (H_2, O_2, CO and CO_2) dissolved in it. These results confirm the data on investigation of Ni powders [1] produced in different media where considerable amounts of impurities were found. The impurities are elements of liquid in use and form different compounds with it.

Reference

1. В.П. Залуцкий, Е.А. Клиндухов, Н.С. Кобзенко, В.И. Патока, А.Е.Перекос, К.В.Чуистов. Структура, фазовый и элементный состав электроэррозионных порошков никеля. Металлофизика,-1991, т. 13, №12, С.35-40.



Temperature and time dependence of gas evolution from C-Ni powder in H .Heating in atmosphere of helium and argon mixture at the pressure that is higher than atmospheric by several mm of mc (mercury column)