

MÖSSBAUER STUDY OF Fe POWDER MECHANICALLY ALLOYED BY POWER ULTRASONICS

Nadutov V.M., Mordyuk B.N., Volosevich P.Yu.
and Svystunov Ye.O.

G.V. Kurdyumov Institute for Metal Physics of the N.A.S. of Ukraine, Kyiv, Ukraine

The objects of study were α -Fe-powder and powder blends of α -Fe and graphite after mechanical activation by power ultrasonics in He environment. The method of ultrasonic mechanical alloying (USMA) was used.

The hyperfine interaction parameters of Fe-particles after USMA were determined from Mössbauer spectra measured at room temperature on MC1101E spectrometer using $\text{Co}^{57}(\text{Cr})$ source. The distribution of sizes of particles and their structure was determined by means of optical and transmission electron microscopy (TEM).

As shown, the phase composition of treated Fe-powder depends on environment and relationship between components of a powder blend. TEM analysis revealed iron oxides in Fe powder after USMA in He environment that however did not reflected in Mössbauer spectra. The sizes of the structural elements of treated Fe-particles were estimated in the range from 0.025 to 1000 μm . It was determined, that the defect structure of Fe particles depends on their dimension.

The USMA of Fe - C powder blend results in formation of a solid solution of carbon in iron. The structure of Mössbauer spectra of powders vs. duration of US treatment was analyzed. The Mössbauer, X-ray and TEM analysis point to existence of the Fe_nC_m carbide. The results of USMA and standard mechanical ball milling of Fe-powder in different environment were compared.