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# Acoustic Emission for Investigation of Processes Occurring at Hydrogenation of Metallic Titanium

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**Abstract :** The acoustic emission is caused by short-time propagation of elastic waves that are generated as a result of quick energy release from sources localized inside some material. In particular, the acoustic emission phenomenon lies in the generation of acoustic waves resulted from the reconstruction of material internal structures. This phenomenon is observed at various physicochemical transformations, in particular, at those accompanying hydrogenation processes of metals or intermetallic compounds that make it possible to study parameters of these transformations through recording and analyzing the acoustic signals. It has been known that at the interaction between metals or inter metallides with hydrogen the most intensive acoustic signals are generated as a result of cracking or crumbling of an initial compact powder sample as a result of the change of material crystal structure under hydrogenation. This work is dedicated to the study into changes occurring in metallic titanium samples at their interaction with hydrogen and followed by acoustic emission signals. In this work the subjects for investigation were specimens of metallic titanium in two various initial forms: titanium sponge and fine titanium powder made of this sponge. The kinetic of the interaction of these materials with hydrogen, the acoustic emission signals accompanying hydrogenation processes and the structure of the materials before and after hydrogenation were investigated. It was determined that in both cases interaction of metallic titanium and hydrogen is followed by acoustic emission signals of high amplitude generated on reaching some certain value of the atomic ratio [H]/[Ti] in a solid phase because of metal cracking at a macrolevel. The typical sizes of the cracks are comparable with particle sizes of hydrogenated specimens. The reasons for cracking are internal stresses initiated in a sample due to the increasing volume of a solid phase as a result of changes in a material crystal lattice under hydrogenation. When the titanium powder is used, the atomic ratio [H]/[Ti] in a solid phase corresponding to the maximum amplitude of an acoustic emission signal are, as a rule, higher than when titanium sponge is used.

**Keywords :** acoustic emission signal, cracking, hydrogenation, titanium specimen
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