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SONOCHEMICAL NANOSTRUCTURING OF CU-ZN ALLOY

Sabbouh M.N.
Scientific supervisor – Ph.D., associate research professor, **Shilovskikh V. V.**
(Infochemistry Scientific Center, ITMO University)

Abstract. Considerable interest has been focused on metal oxides nanoparticles due to their potential applications in diverse fields including catalysis, magnetic recording media, or microelectronics. Various methods are now known which enable one to prepare these nanoparticles with controlled size and shape, among these methods, sonochemical treatment is one of the most promising and interesting.

Introduction. High intensity ultrasound can be used for the production of novel materials and provides an unusual route from functional matter from known bulk materials without utilizing high temperature, high pressure, or long reaction times.

Several phenomena are responsible for sonochemical modification and specifically the production of nanomaterials during ultrasonic irradiation .the most notable effects are caused by acoustic cavitation (the formation, growth, and implosive collapse of bubbles),and can be categorized as primary sonochemical effects (gas-phase processes occurring inside collapsing bubbles),secondary sonochemical effects (solution-phase chemistry occurring outside the bubbles), and physical modifications (caused by high-speed jets or shock waves derived from bubble collapse).

high intensity ultrasound can be exploited for the preparation or modification of a wide range of nanostructured materials and used as an important source for the initiation or enhancement of catalytic reactions, in both homogeneous and heterogeneous systems.

Main part. The aim of our research is to activate surface of readily available and cheap brass and enhance catalytic activity of copper and zinc ions. Such effects can occur in three distinct stages: (1) during the formation of supported catalysts, (2) activation of preformed catalysts, or (3) enhancement of catalytic behavior during a catalytic reaction. In this work we focus on the second approach due to its least cost and its versatility. In our work we used copper-zinc alloy (brass) in forms of powder and flat plates. Powders were used as furnished, plates were cut from a single sheet, grinded on a sandpaper and polished on progressively smaller diamond powders with the ending step of 0.5µm. Then samples were exposed to high energy ultrasonic treatment. A series of samples was exposed to ultrasonic irradiation of different intensity, the samples were studied with a number of methods including optical and scanning electron microscopy.

Conclusions. Electron backscatter diffraction data shows that initially brass consists of grains up to 100 μm^2 in area. Metal surface after intensive irradiation undergo shockwave deformations which do not decrease grainsize, but greatly enhances internal misorientation degree which can result in significant increase in active sites' number and thus in catalytic activity of both copper and zinc. It was shown that brass alloy does not change its surface hardness which means that perspective catalyst may be used in almost every field where brass is mechanically applicable. results indicated that the size and number of craters increase with increasing beam current density.

Sabbouh M.N. (author) Signature

Shilovskikh V. V. (Scientific supervisor) Signature