

VINČA INSTITUTE of NUCLEAR SCIENCES, UNIVERSITY of BELGRADE  
HYDROGEN STORAGE INITIATIVE SERBIA

# **PROGRAMME AND THE BOOK OF ABSTRACTS**

3<sup>rd</sup> International Symposium on Materials for Energy Storage and  
Conversion - mESC-IS 2018

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## Influence of platinization of mechanically activated nuclear grade graphite powders on the hydrogen adsorption process

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Non-activated powder of nuclear grade graphite and powders of nuclear grade graphite that were milled for 10, 20 and 30 minutes are doped with 0.03% of platinum. XRD analysis of initial and activated graphite powders was used for structural characterization. Hydrogen adsorption performed in isothermal conditions showed that platinization of powder samples of nuclear grade graphite decreases time needed for reaching adsorbent saturation during hydration. Simultaneously it was shown that platinization, due to the hydrogen spillover effect, increases adsorption capacity in a function of mechanical activation duration.

Increase of the adsorption capacity, in comparison to the non-platinized samples (relative to non-platinized samples) is: 5% for initial non-activated sample, 12% for graphite milled 10 minutes, 18% for graphite milled 20 minutes and 26% for graphite milled 30 minutes. The analysis of isothermal time dependencies of hydrogen pressure in the chamber, at the temperatures of 60 °C, 70°C and 80°C, enabled definition of adsorption mechanism in the powders. At the same time, the kinetic parameters of hydrogen adsorption process are determined.

Figure 1 shows observed average chamber pressure change for non-platinized and platinized samples of different milling times, illustrating the effect of platinization on increase of adsorption capacity. Figure 2 shows the results of calculations of pressure change using ideal gas equation in case of average applied initial pressure (1.6 bar) and average temperature for isothermal treatment (70°C).

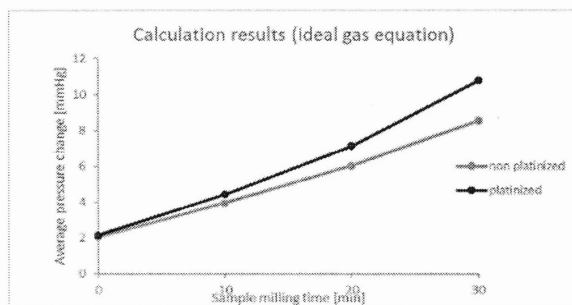


Figure 1. Average chamber pressure change observed in measurements

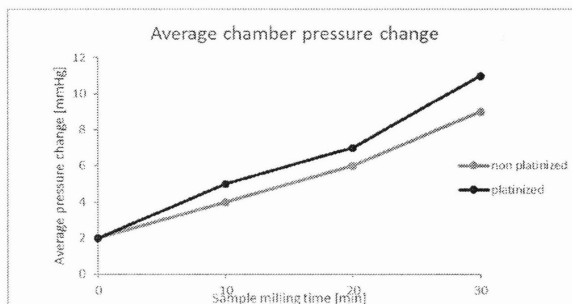


Figure 2. Calculated average pressure change for medium temperature (70 °C) and medium initial pressure (1.6 bar)

**Key words:** nuclear graphite, hydrogen, platinization, hydrogen adsorption



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