

In situ observation of C₆₀ hydrogenation reaction using gravimetric method

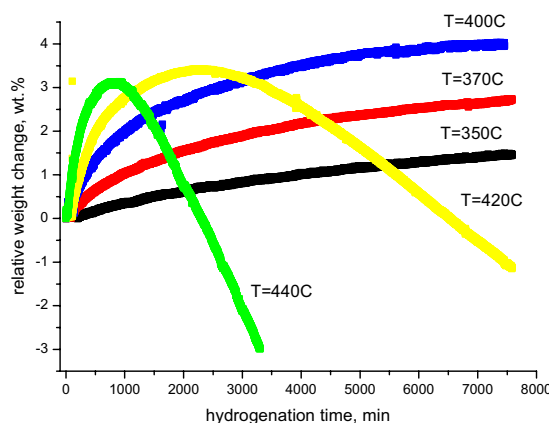
Luzan S.M.^{1*}, Tsybin Y.O.², Talyzin A.V.¹

¹Department of Physics, Umeå University, 90 187 Umeå, Sweden

²Biomolecular Mass Spectrometry Laboratory, Ecole Polytechnique Fédérale de Lausanne, 1015 Lausanne, Switzerland

*e-mail: serhiy.luzan@physics.umu.se

Reaction of fullerene C₆₀ with hydrogen gas was studied in a broad temperature interval and over prolonged periods of time. Hydrogenation was monitored in situ at high temperature and high hydrogen pressure conditions using gravimetric method. The shape of gravimetric curve was found to depend on temperature of hydrogenation: in the temperature interval of 623-673K saturation of sample weight was achieved, while at temperatures of 693-713K the sample weight went through the maximum and decreased upon prolonged hydrogenation. The weight decrease is explained by fragmentation of fullerene cage with formation of light hydrocarbons which evaporate from the sample. Products of hydrogenation were studied by X-ray diffraction, MALDI-TOF mass spectrometry, APPI FT-ICR mass spectrometry, HPLC chromatography, and elemental analysis. It was found that the reaction resulted in a set of hydrogenated fullerenes with different content of hydrogen (from C₆₀H₁₈ up to C₆₀H₅₆) as well as some fragmented fullerenes with less than 60 carbon atoms.



Time dependence of hydrogenation of fullerenes C₆₀ performed at different temperatures.