# Core-shell nanohybrid particles for controlled release of ibuprofen

Noémi Varga[1], Gabriella Bohus[2], Mária Benkő[2], Imre Dékány[3*]

*1 Department of Physical Chemistry and Materials Sciences, University of Szeged, Hungary, 6720 Szeged, Aradi v.t. 1. Hungary*
*2 Supramolecular and Nanostructured Materials Research Group of the Hungarian Academy of Sciences, University of Szeged, 6720 Szeged, Aradi v.t. 1. Hungary*
*3 Department of Medical Chemistry Faculty of Medicine, University of Szeged, Hungary 6720 Szeged, Dóm tér 8.*
** e-mail: i.dekany@chem.u-szeged.hu*

A great deal of scientific research has been focusing on biocompatible composites because it can be used as drug-delivery systems under the desired circumstances. First, we have applied the bovine serum albumin (BSA) - the most abundant protein in blood plasma - as a core. The shell consists of a biodegradable polymer, the PSS [poly(sodium 4-styrenesulfonate)]. The formation of core shell nanoparticles are developed in aqueous solutions. The model drug was ibuprofen, because it has a short biological half-life (30 min-2 hour), so this is a suitable candidate for controlled drug delivery. At pH=3, BSA is a positively charged molecule and the binding with ibuprofen occurs through electrostatic interaction. The infrared spectra (FT-IR) show the changes in the protein's secondary structure caused by the attachment to the BSA. According to the transmission electron microscopy (TEM) images and the dynamic light scattering (DLS) measurements the size of the BSA core shell nanoparticle is about 100 nm.

The second possibility of preparing a biocompatible drug-delivery system, is using a porous silica core which captures the drug (ibuprofen) molecule in it's pores. The formation of silica core shell nanoparticle has been investigated at pH=3,4. The positively charged shell, which is able to create an electrostatic interaction with the negatively charged silica, is the PEI (polyethylenimine) polymer. The infrared spectra show several phenomena, like the ibuprofen-silica interaction and the formed hydrogen bond between the silanol group of the mesoporous silica and the carboxylic group of the ibuprofen. The size of silica nanoparticles is between 500-600 nm. We compared the drug release results of the two different methods with and without a shell. Finally we have investigated the influence of the shell on the release rate.

**References**

[1] Ulrich Kragh-Hansen, Victor Tuan Giam Chuang, and Masaki Otagiri *Biol. Pharm. Bull.* 25(6) (2002) 695—704

[2] Fengyu Qu, Guangshan Zhu, Huiming Lin, Weiwei Zhang, Jinyu Sun, Shougui Li, Shilun Qiu *Journal of Solid State Chemistry* 179 (2006) 2027–2035

**Acknowledgements**

This work was supported by competitions TÁMOP-4.2.2/B-10/1-2010-0012 and TÁMOP-4.2.2.A-11/1/KONV-2012-0047.