

Adsorption of bovine serum albumin (BSA) on silica aerogel surface

Madalina Ranga^{a,b}, Attila Forgács^{a,b}, József Kalmár^a, István Fábán^{a,b}

a) Department of Inorganic and Analytical Chemistry, University of Debrecen,
Egyetem tér 1., H-4032 Debrecen, Hungary

b) MTA-DE Redox and Homogeneous Catalytic Reaction Mechanisms Research
Group Egyetem tér 1., H-4032 Debrecen, Hungary e-mail: madalina.ranga@mail.ru

The mechanism of the adsorption of bovine serum albumin (BSA) was studied on archetypical mesoporous silica aerogel made by the sol-gel method.

Silica aerogels are widely used as drug delivery systems, thermal insulators, medical scaffolds and adsorbents. [1-3] In the biomedical applications, the aerogel interacts with biological macromolecules, e.g. with proteins. Our research focuses on the adsorptive properties of the archetypical silica aerogel towards a serum protein. The BSA was chosen as a model compound, due to its 98% similarity to the HSA, which is making it a good choice to relate to human serum studies.

All kinetic measurements were carried out at two different pH values; 4.6 and 6.4 in acetate and in phosphate buffer at constant ionic strength $I = 0.10$ M (Figure 1). The concentrations of both the BSA and the silica aerogel were varied. Additionally, Zeta potential measurements were performed in order to determine the isoelectric points of the silica aerogel and the BSA. An elaborate mechanistic realistic kinetic model is postulated to account for the experimental results.

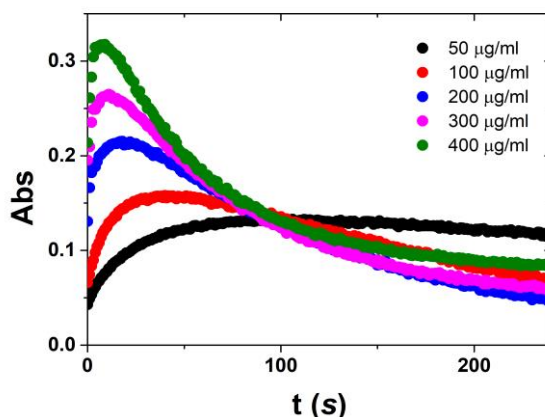


Figure 1. Time-resolved absorbance change that follows the adsorption of different initial concentrations of BSA on 100 µg/ml silica aerogel in acetate buffer at pH=4.6.

References:

1. Kéri, M., Forgács, A., Papp, V., Bányai, I., Veres, P., Len, A., Dudás Z., Fábán I., and Kalmár, J. (2020). *Acta Biomaterialia*, 105, 131-145.
2. Su, L., Li, M., Wang, H., Niu, M., Lu, D., & Cai, Z. (2019). *ACS Applied Materials & Interfaces*, 11(17), 15795-15803.
3. El-Naggar, M. E., Othman, S. I., Allam, A. A., & Morsy, O. M. (2020). *International Journal of Biological Macromolecules*, 145, 1115-1128..