# Determination of dimensions of engineered spider silk spheres by atomic force microscopy

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Spider silk is a natural building material formed by spiders' silk glands. It has numerous unique properties such as: incredible strength and high biocompatibility, which makes it a good material for future applications in both industry and medicine. In order to ensure the high amount of top quality material for an industrial scale, the methods of spider proteins (spidroins) production in form of engineered spider silk (ESS) were developed [1, part I]. ESS is a base which is used for the production of various biomaterials as: nano- and microspheres, microcapsules and ultra-durable fibers. One of the main applications of the protein spheres is a usage in physical drug delivery systems. An important advantage of such a system (in comparison with other materials) is controlled release of substances at their destination and its biodegradability. The protein spheres can be obtained by spontaneous aggregation of proteins during the mixing process in presence of appropriate concentration of phosphate ions [1, part II]. Careful size control of the obtained spheres is an important element for their application as a drug delivery system. The aim of this work was to determine the dimensions of the protein spheres prepared in various conditions. The study was done by means of Atomic Force Microscopy. For the purpose of measurements, isolated spheres were sought. Unfortunately, due to the strong intermolecular interactions, protein spheres may aggregate and deform each other mutually (Fig. 1).

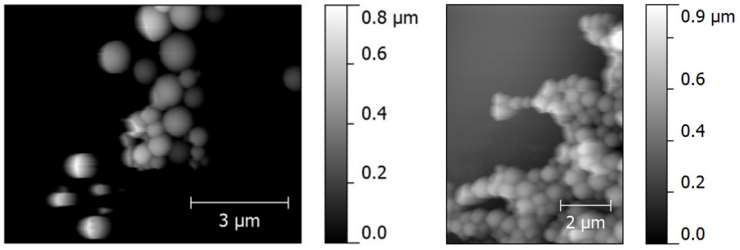


Fig. 1. ESS spheres - aggregation and deformation processes.

Also slightly hydrophilic substrate of the sample causes additional flattening of the spheres. Due to the nature of the measurement by scanning probe, the curvature and size of the tip should be also considered. These effects were taken into account in the determining the size of the spheres.

**References.**

[1] A. Florczak, K. Piekoś, K. Kazimierska, A. Mackiewicz, H. Dams-Kozłowska: *Engineered spider silk: the intelligent biomaterial of the future. Part I and II.* Postepy Hig Med Dosw (online), 2011; 65: 377-396.