MULTIFUNCTIONAL NANOGELS AS BUILDING BLOCKS FOR NANOSTRUCTURED MATERIALS

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Synthesis of aqueous nanogel particles can be performed in controlled way to tune particle size and size distribution, chemical functionality, surface charge, swelling degree, colloidal stability and stimuli-sensitivity. The post- modification reactions provide a tool-box for incorporation of small organic molecules, synthetic polymers, biopolymers or inorganic nanoparticles into colloidal nanogel network thus leading to the formation of multifunctional colloids. Such colloids may exhibit electrical conductivity, magnetic response, optical and catalytic activity and can be used as building blocks for the preparation of well-ordered nanostructured materials of different dimensions and complexity. By controlled self-assembly of nanogels in solution, on interfaces or surfaces defined architectures like colloidosomes, fibers, networks, arrays or films can be obtained (Figure 1).

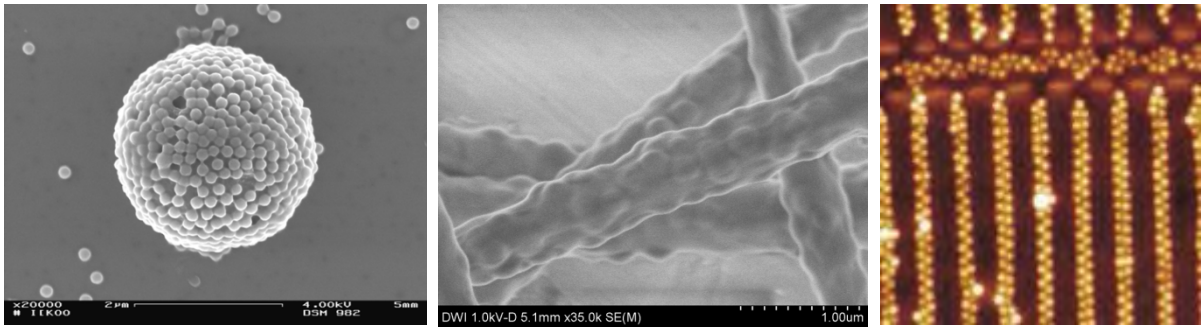

Figure 1. Nanogel-based sensitive materials: capsule (l); fibers (m) and array (r).

In present paper we will present some examples of nanogel-based materials. We have developed a simple route for the preparation of the novel multi-sensitive nanogel-based capsules.[1]The variation of the microgel and polymer properties as well as their concentration provides a control over important capsule parameters such as size, morphology, wall thickness, degradability etc. Nanogel- and nanogel/polymer-based composite microfibers can be prepared by electrospinning process.[2] Obtained microfibers with tunable dimensions, swelling behaviour and mechanical properties have been obtained by varying the nanogel properties (size and chemical structure), nanogel/polymer ratio and viscosity of spinning solution. The large scale self-assembly of nanogels using nanostructured substrates was investigated. Different behaviour for the microgel types arranged in grooves of wrinkles was observed concerning particle shape and pattern formation.[3] Single particle lines as well as zigzag-structures were obtained. By using wrinkles as stamps in a printing approach nanogel arrays were transferred on planar substrates.

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[2] S. Piperno, L. A. Gheber, A. Pich, G. Dvorakova, A. Biffis, Polymer 2009, 50(26), 6193-6197.
[3] S. Hiltl, M. Schürings, A. Balaceanu, V. Mayorga, C. Liedel, A. Pich, A. Böker, Soft Matter 2011, *7*, 8231-8238.

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