

Workshop »Coatings for Biomedical Applications«

Energetic electron assisted synthesis of bioderived smart hydrogels and ferrogels – fundamentals, applications, perspectives

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Energetic electron beams constitute a highly versatile tool for tailoring biomaterials properties of bioderived hydrogels with high spatial resolution. Based on electron-induced hydrolysis, reactions, ranging from crosslinking, chain scission and functionalization to arrest of magnetic nanoparticles, can be induced without the need for adding additional - potentially hazardous - reagents. This allows for synthesis of highly bioactive switchable composites, in particular ferrogels, stimuli responsive gels as well as shape memory gels. Within this presentation we will first review the fundamentals of energetic electron assisted hydrogel modification, regarding particularly the reaction kinetics in collagen. We will then focus on applying these findings for tailored hydrogel modification towards stimuli responsive gels, in particular ferrogels. This includes a collagen-based ferrogel actuator with reversible peak strains as large as 150 %. We will also discuss application within the field of biomedicine, that are currently being developed, as well as future visions in an outlook.