

FABRIC MODIFICATION BY RADIATION METHODS

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Our research groups is devoting to develop the fabric modification by radiation methods, especially by radiation induced graft polymerization of functional monomers or together with nanoparticles.

The first research routine is based on radiation induced graft polymerization of the vinyl monomers. As a first step, by grafting the functional acrylate or methacrylate we can prepare superhydrophobic cotton fabrics which are durable for laundering and friction¹⁻³. Furthermore, by grafting and then amination or amidoxination we can prepare the metal ion exchangeable fabric for gold adsorption and reduction⁴ or uranium extraction from seawater⁵⁻⁷.

The second research routine is based on radiation induced co-graft polymerization of the vinyl monomers and the inorganic nanoparticles, for example, functionalized TiO₂ nanoparticles⁸ or graphene oxide⁹.

Very recently, we combined the radiation induced graft polymerization with the radiation induced reduction, which resulted in an antibacterial cotton fabrics grafted with pomegranate-shaped polymer wrapped in silver nanoparticle aggregations¹⁰. This pomegranate-shaped silver NPAs functionalized cotton fabric exhibits outstanding antibacterial activities and also excellent laundering durability, where it can inactivate higher than 90% of both *E. coli* and *S. aureus* even after 50 accelerated laundering cycles, which is equivalent to 250 commercial or domestic laundering cycles.

The most advantage of the radiation methods in fabric modification is lying in the formation of the covalent bonds between the cellulosic macromolecules and the graft chains or together with the nanoparticles, which is the key point for the laundering durability and permanent functionalization.

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