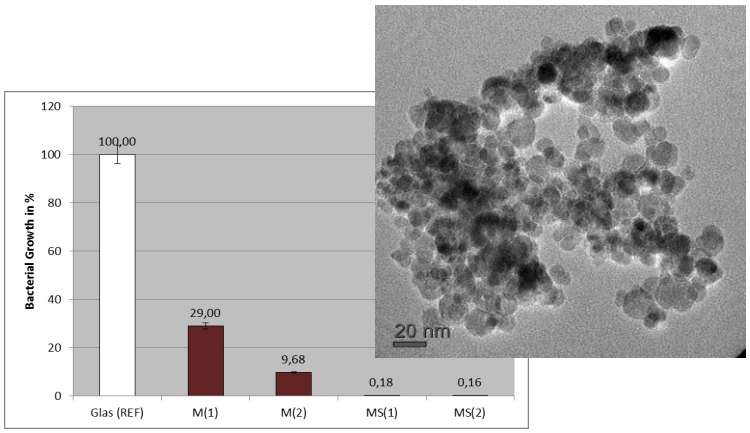
Functional magnetic core-shell nanoparticles

Transfer offer

Superparamagnetic core-shell nanoparticles in the size range of 10 – 25 nm are synthesized wet-chemically in a 2-step process. The nanoparticles have a magnetite core, which is provided with a functional shell, e.g. silver for an antibacterial effect. The particles can be functionalized hydrophobic as well as hydrophilic and can therefore be used in many different ways, e.g. as additive in polymer processing as wells as in the sol-gel technology.



TEM-picture of magnetite@silver (MS) core-shell nanoparticles (right above) and their antibacterial activity in comparison to float glass and uncoated magnetite (M) nanoparticles

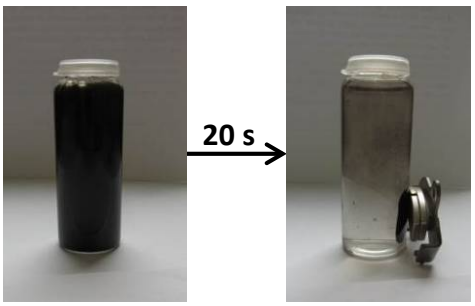
Technical Solution

With the help of these special nanoparticles, it is possible to provide layers with corresponding functions, such as an antibacterial effect. Due to the magnetic properties of the particles, they can be regionally concentrated during layer generation applying corresponding magnetic fields. The consistency of the particle dispersion can be adjusted depending on the concentration from powder to paste (applicable for polymer composites) to oil (applicable for printing).

Adjustable texture of nanoparticle - oleic acid - dispersion by tuning the particle-concentration (left: powder with 90% NP, middle: paste with 50% NP, right: oil with 25% NP).

Advantages

- **Easy separation from dispersion media with a magnet**
- **Different materials useable for the shell**
- **Different textures adjustable**
- **Dispersion is possible in polare as well as in unpolare solvents**
- **Relatively simple synthesis of the particles**



Separation of magnetite nanoparticles from aqueous dispersion using a magnetic field.

Polypropylene-fibres, surface modified using core-shell nanoparticles (left). Increased concentration of particles on the fibre surface after treatment in a magnetic field (EDX-picture)

Level of development and property rights

The particle synthesis is optimized for silver coated magnetite nanoparticles. Other coatings, for example other metalls or metall oxides, are possible using this method. The particles have already been successfully used for the surface modification of fibers (see left) and within certain sol-gel processes.

Kontakt
Dr. Sven Gerullis SG@innovent-jena.de
Dr. Sebastian Spange SS2@innovent-jena.de
Phone +49 3641 2825-51
www.innovent-jena.de/en