

Production and Application of Nanoparticles

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Taking the definition of Nanotechnology like it is elaborated at the European Academy at Bad Neuenahr: *Nanotechnology is dealing with functional systems based on the use of subunits with specific size-dependent properties of the individual sub-units or of a system of those*; it is clear that nanosized particles play an important role as the mentioned sub-units in the field of nanotechnology. Particles are used as building blocs for larger structures with interesting additional functionality, for the fabrication of thin and thick films or finally as single particles. Beside the use of these interesting properties of nanoparticles based on quantum confinement or on the high surface to volume ratio, nanosized particles are also used because of changes in processing parameters based on decreased melting temperature or high reactivity. The latter is in combination with size dependent biological properties very often the reason for safety problems.

It is obvious that for nanosized particles with a diameter less than 100 nm the synthesis method plays an important role regarding the properties of the particles. On the other hand the synthesis method has to be adapted to the final use of the particle. An example is the synthesis of superparamagnetic particles for medical applications where the fabrication has to be carried out in an aqueous media and only biocompatible surfactants can be used for the synthesis. The latter example also shows that not only a particle is of interest, surface modifications and coatings are necessary for most of the application.

In this presentation an overview of realized and potential applications of nanoparticles will be given. Starting from applications like thick films for ink jet papers and functional particles in cosmetic articles, more sophisticated applications in electronic and medicine are shown. In relation with the application of the particle including properties, amount and safety aspect, the synthesis methods of the particles will be discussed.