66f Biodegradable, Nanoparticulate Polymer Fillers

Stefan Loher, Matthias Huber, and Wendelin J. Stark

Mineral fillers today are widely used in plastics production to improve performance and reduce resin costs. The world wide filler market volume is estimated to lay around 15 million tons per year. Most prominent materials are calcium carbonate (60-70% of filler market), carbon black and silica. With an increasing interest in degradable polymers for waste reduction and medical application, different materials have been tested as degradable polymer fillers. Flame spray pyrolysis has established itself as a suitable method for the preparation of nanoparticles, most notably, oxides containing main group and transition metals. It has rapidly evolved into a scalable process for oxide nanoparticles for possible applications in various fields. The industrial-scale flame-aerosol synthesis today produces megaton quantities of carbon, silica and titania nanoparticles. Such commercial nanoparticles are already used as classical fillers in polymers. In the present work, we would like to extend the range of accessible flame-made nanoparticles for polymer applications from conventional oxides and carbon to metal salts. Amorphous and crystalline calcium carbonate and calcium phosphate nanoparticles with high purity have been successfully prepared by flame spray synthesis [1,2]. Such particles are of excellent biodegradability and may be used as fillers in degradable polymers.

1. Huber, M. et al. Flame synthesis of calcium carbonate nanoparticles. *Chemical Communications*, 648-650 (2005).

2. Loher, S. et al. Fluoro-apatite and calcium phosphate nanoparticles by flame synthesis. *Chemistry of Materials* **17**, 36-42 (2005).

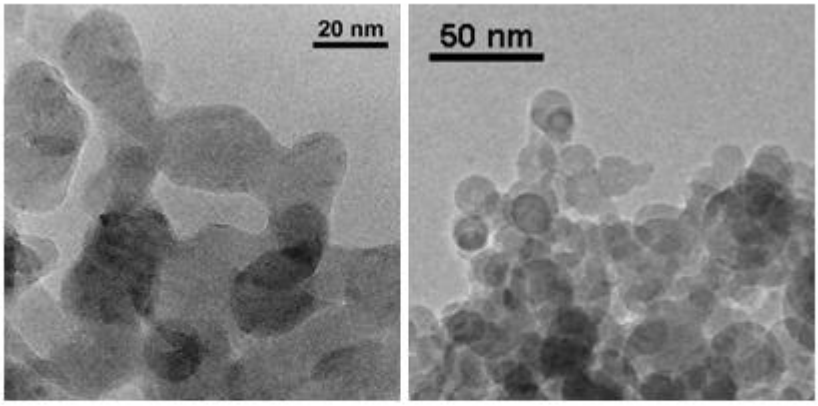

Fig. 1: Transmission electron micrograph of flame-made amorphous calcium carbonate (left) and calcium phosphate (right) nanoparticles. The morphology resembles the structure of fumed silica.