

### **354c Visibly Transparent and Radiopaque Inorganic Organic Composites from Flame-Made Mixed-Oxide Fillers**

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Radiopacity is an important property of biomedical composites since it enables their detection / localization in x-ray scanning. Highly radiopaque composite materials have been obtained by synthesis of ytterbium oxide with the well established silica filler in the one step aerosol spray flame (FSP) process [1]. The manufactured composite containing the FSP-filling material showed improved mechanical properties with a higher transparency than conventional fillers [2]. The atomic mixing of the two elements within the nanoparticles gave very homogeneous optical properties such as refractive index over the whole particle. A new method based on the Becke-line approach was developed to measure the refractive index of nanoscaled powder directly. The refractive index of the filler powder increased with ytterbium oxide loading. A high transparency was achieved for a matching refractive index of the filler powder and the polymer using a carboxylic acid based precursor in comparison to commercial materials. It was demonstrated that powder homogeneity with regard to particle morphology and distribution of the individual metal atoms is essential to obtain a highly transparent composite. The superior physical strength, transparency and radiopacity compared to composites made from conventional silica based-fillers makes the flame-made mixed-oxide fillers especially attractive for dental restoration materials.

[1] Mädler, L., Krumeich, F., Burtscher, P. Moszner, N., J. Nanoparticle Res. accepted (2005). [2] H. Schulz, L. Mädler, S. E. Pratsinis, P. Burtscher, and N. Moszner, Adv. Funct. Mat. 15 (5), 830 (2005).