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Production of nano particles

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Nano particles (particles having diameters in the nanometer range) have applications in a variety of areas including medical, environmental, sensor, to name a few. However, the production of nano particles having uniform size and properties is challenging. A number of methods have been proposed for production of nano particles such as flame synthesis, aerosol decomposition using indirect heating, and laser ablation. In this work we used a flame synthesis process to produce nano particles of aluminum oxide (Al_2O_3). Aluminum oxide is used in ceramic industry. The nano size particles can change various mechanical and physical properties of Al_2O_3 based materials significantly. Two different precursor salts were used for production of Al_2O_3 . The first one was aluminum nitrate-nano hydrate ($\text{Al}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$) of different concentrations and the other one was aluminum acetate basic ($(\text{C}_2\text{H}_3\text{O}_2)_2\text{AlOH}$). An aqueous solution of these salts flowed through a mini-mist nozzle and the resulting spray was decomposed in a methane-air flame to produce the particles. Different concentrations of aluminum nitrate and nozzle sizes were used to investigate their effect on the particle size. The particles were analyzed using a scanning electron microscopy (SEM) that showed particles with different sizes, shape and having a porous surface. Although particles in the nano size range were produced, some particles were also in the micron size range. The precursor salt also had significant effect on the particle morphology.