Vol. 12, No. 4, 2003

Influence of the Reduction Agents on the Microstructure and Tetragonality of $BaTiO_3$ Powder Prepared by SHS

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The combustion process has been applied to synthesize high tetragonality barium titanate powders in the submicron range from the BaO_2-TiO_2-reduction agent mixture. Urea-$CO(NH_2)_2$, hexamethylenetetramine-$C_6H_{12}N_4$) and titanium hydride-TiH_2 were used as reduction agents. The evolution of the combustion process and temperature distribution in the combustion wave were studied using on-line thermocouple techniques. Phase transformation, crystallite size and degree of tetragonality of the as-recieved $BaTiO_3$ powders were investigated as a function of the combustion temperature and the type of reduction agent using the X-ray diffraction method, and particle size and morphology were studied using scanning electron microscopy. When combustion temperature increased, $BaTiO_3$ transformed from the cubic to the tetragonal phase. High purity unagglomareted tetragonal $BaTiO_3$ with 0.5-1.0 μm particle size was obtained at the presence of molten NaCl using TiH_2 as a reduction agent.