Processing of Chemical Solution-deposited BaTiO(3)-based Thin Films on Ni Foils

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Source: Journal of Materials Science **Volume**: 46 **Issue**: 1 **Pages**: 136-144 DOI: 10.1007/s10853-010-4873-x **Published**: January 2011

Abstract: BaTiO(3) films on base metal foils are of interest for capacitor applications, but the processing requires reducing atmospheres that influence the film defect chemistry and density. In this study, powders dried from barium titanate solutions and barium titanate films were studied by X-ray diffraction, differential scanning calorimetry, thermal gravimetric analysis, infrared spectroscopy, and spectroscopic ellipsometry at various points in the processing. It was found that atmospheres designed to minimize Ni oxidation delay decomposition of organics, leading to retained carbonate phases. Thus, crystallization of the barium titanate occurs via decomposition of a barium carbonate phase. Retained organics that are present during high temperature processing can cause porosity in the films. On annealing at 1000 A degrees C, there is slightly increase in the refractive index of the film due to further crystallization and densification. The final refractive index is comparable to that of 95% dense barium titanate ceramics. Re-oxidation did not change the refractive index of the film over the wavelength range from 350 to 650 nm.

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