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Fabrication of PZT Film by a Single-Step Spin Coating Process

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To obtain ceramic films, the sol-gel coating technique has been broadly used with heat treatment, but crack formation tend to occur during heat treatment in thick sol-gel films. We prepared PZT thin films by sol-gel method with single-step spin coating process. The PZT solution have been synthesized using lead acetate ($Pb(CH_3COO)_2$), zirconium acetylacetonate ($Zr(OC_3H_7{}^{n})_4$), and titanium diisopropoxide bis(acetylacetonate) 75wt% in isopropanol ($Ti(OC_3H_7{}^{i})_2(OC_3H_7{}^{n})_2$) as starting materials and n-propanol was selected as a solvent. The poly(vynilpyrrolidone) (PVP) was added with 0, 0.25, 0.5, 0.75, and 1 molar ratios to control viscosity of solution. We investigated influence of the viscosity on thickness, microstructure, and electrical properties of final PZT films. Thermo-gravimetric analysis and differential scanning calorimeter (TGA/DSC) was carried out from room temperature to 800^{o}C in order to measure pyrolysis temperature. Structural characteristics were analyzed by X-ray diffraction (XRD) and scanning electron microscopy (SEM). Ferroelectric and dielectric properties were measured by RT66A (Radiant) and impedance analyzer (Agilent), respectively. The thicknesses of PZT films depended on incorporation of an excess amount of PVP. Finally, we obtained PZT films of good quality without crack formation via single-step spin coating.

Keywords: PZT, sol-gel, single-step spin coating, PVP