Structural Analysis of Enhanced Ferroelectricity in Nano-Composite Films of Sodium Nitrite in poly-Vinyl Alcohol Matrix Fabricated at Moderate Elevated Temperature

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In the present study, various composite films of NaNO₂-PVA differing in their weight percentage composition have been prepared on brass substrates by solvent drop cast method at optimized elevated temperature of 70 °C. Improved ferroelectric response was observed in the films with equal weight percentage composition giving remanant polarization, $P_r \sim 45.45 \mu\text{C}/\text{cm}^2$. The peak polarization current density J_{max} was also maximum for this composition with measured value of $J_{\text{max}} = +6.13 \times 10^{-2} \text{A}/\text{cm}^2$ at 3.09 kV/cm and $J_{\text{max}} = -6.13 \times 10^{-2} \text{A}/\text{cm}^2$ at -2.68 kV/cm. The average crystallite size calculated using Scherrer relation was found to be lying in the nano-scale range. This calculated value from XRD studies was in good agreement with the particle size observed with transmission electron microscopy (TEM). The minimum strain $\sim 0.62\%$ and increased b/a ratio ~ 1.6269 in the NaNO₂ - PVA nano-composite film containing equal weight percentage might have improved the ferroelectric phase of the nano-composite system exhibiting improved remanant polarization.

Keywords: Ferroelectricity, NaNO₂-PVA composite-films, XRD, strain, crystallite size, TEM

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