

### *(Research Articles 3)*

## **X-Ray Diffraction and Differential Scanning Calorimetry of BaTiO<sub>3</sub>/ Polyvinyl Chloride Nanocomposites**

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Aiming to improve the inferior properties of polyvinyl chloride polymer, (BaTiO<sub>3</sub>)<sub>x</sub>(PVC)<sub>100-x</sub> composite samples were prepared and investigated. The structural changes of the composite (BaTiO<sub>3</sub>)<sub>x</sub>(PVC)<sub>100-x</sub> were studied as a function of BT content using FTIR, XRD and DSC measurements. Attention is paid to the tetragonality changes during composition changes. It was found that the hindrance to the PVC crystallization becomes less and less serious with the increase of BT ratio in the composite. This behavior could be attributed to the interaction between Ba<sup>+2</sup> ions and Chlorine in the polymer. The FTIR spectra indicate a clear interaction between PVC and BaTiO<sub>3</sub> particles as is concluded from XRD results. The Scherrer formula was used to estimate the grain size for the included BT in the (BaTiO<sub>3</sub>)<sub>x</sub>(PVC)<sub>100-x</sub> composite samples. The composite samples show abnormally small tetragonality for its BT content less than unity ( $c/a < 1$ ). It seems that in (BaTiO<sub>3</sub>)<sub>x</sub>(PVC)<sub>100-x</sub> composite samples, the stress that stabilized the tetragonal phase of the core regions of BT decreased, leading to lower tetragonality ( $c/a$  ratio). It seems that  $T_g$  of the composite samples increases with the increase of its BT content. Also DSC results reveal the increase of crystallization with the increase of BT content in the composite.