

## **Surface Thermo-Dynamic Characterization of Poly (Vinylidene Chloride-Co-Acrylonitrile) (P(VDC-co-AN)) Using Inverse-Gas Chromatography and Investigation of Visual Traits Using Computer Vision Image Processing Algorithms**

### **ABSTRACT**

The Inverse Gas Chromatography (IGC) technique has been employed for the surface thermo-dynamic characterization of the polymer Poly(vinylidene chloride-co-acrylonitrile) (P(VDC-co-AN)) in its pure form. IGC attributes, such as London dispersive surface energy, Gibbs free energy, and Guttman Lewis acid-base parameters were analyzed for the polymer (P(VDC-co-AN)). The London dispersive surface free energy ( $\gamma_L S$ ) was calculated using the Schultz and Dorris–Gray method. The maximum surface energy value of (P(VDC-co-AN)) is found to be  $29.93 \text{ mJ}\cdot\text{m}^{-2}$  and  $24.15 \text{ mJ}\cdot\text{m}^{-2}$  in both methods respectively. In our analysis, it is observed that the  $\gamma_L S$  values decline linearly with an increase in temperature. The Guttman–Lewis acid-base parameter  $K_a$ ,  $K_b$  values were estimated to be 0.13 and 0.49. Additionally, the surface character  $S$  value and the correlation coefficient were estimated to be 3.77 and 0.98 respectively. After the thermo-dynamic surface characterization, the (P(VDC-co-AN)) polymer overall surface character is found to be basic. The substantial results revealed that the (P(VDC-co-AN)) polymer surface contains more basic sites than acidic sites and, hence, can closely associate in acidic media. Additionally, visual traits of the polymer (P(VDC-co-AN)) were investigated by employing Computer Vision and Image Processing (CVIP) techniques on Scanning Electron Microscopy (SEM) images captured at resolutions  $\times 50$ ,  $\times 200$  and  $\times 500$ . Several visual traits, such as intricate patterns, surface morphology, texture/roughness, particle area distribution (DA), directionality (DP), mean average particle area ( $\mu_{\text{avg}}$ ) and mean average particle standard deviation ( $\sigma_{\text{avg}}$ ), were investigated on the polymer's purest form. This collective study facilitates the researches to explore the pure form of the polymer Poly(vinylidene chloride-co-acrylonitrile) (P(VDC-co-AN)) in both chemical and visual perspective.