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THE EFFECTS OF PROCESSING PARAMETERS AND LAYERED SILICA NANOCLAY CONTENT ON MORPHOLOGY OF MICROCELLULAR FOAM BASED ON PP/EPDM/ORGANOCLAY BY RESPONSE SURFACE METHODOLOGY (RSM)

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Microcellular foam is a new class of material with superior properties due to smaller cell size and higher cell density compared to ordinary foams. In this work, microcellular foam of PP/EPDM/Organoclay with supercritical nitrogen as physical blowing agent via batch process was produced. Experimental design was carried out based on Box-Behnken methods and the effects of saturation pressure and foaming time as well as nano layered silica content on nucleation and final foam morphology were studied using the Response Surface Methodology (RSM). Three levels of saturation pressure, nano clay content, and foaming time were chosen in this study. The mathematical model and response surface graphs have been used to illustrate the relationship between considered parameters and foam morphology. The results revealed that the cell density and cell diameters were affected by nano clay and pressure. Cell density was in the range of 10^9-10^{10} cell/cm^3. The larger cell sizes were observed as a result of increasing foaming time. Nucleation mechanism was discussed using classic nucleation theory. In addition distribution of nano particles in the blend was traced by means of Small Angle X ray Scattering (SAXS), Dynamic Mechanic Thermal Analysis (DMA) and the results compared with that of predicted via wetting coefficient which calculated by Youngs equation. Intercalation/partially exfoliation structure was observed and its effect on the nucleation mechanism was discussed. Nano particles acted as nucleating agents and changed the nucleation mechanism from homogenous to heterogeneous by decreasing the nucleating free energy.