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OPTIMIZING THE LONG CHAIN BRANCHING PROCESS OF POLYPROPYLENE USING TAGUCHI METHOD OF EXPERIMENTAL DESIGN TO PRODUCE BALANCED EXTRUDED POLYPROPYLENE FOAM

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A high melt strength polypropylene resin suitable for foaming process was prepared from a commercial homo-polypropylene using reactive extrusion process via long chain branching. Effects of four variables on the melt strength of polypropylene in reactive extrusion were investigated applying taguchi method of experimental design. The studied variable in long chain branching process includes hydroquinone, styrene, benzoyl peroxide and PP-g-MAH. By melt mixing of polypropylene, initiator, styrene monomer, hydroquinone, EVA, PP-g-MAH and calcium stearate in a lab scale twin extruder, the high melt strength PP was made.
Using dibenzoyl peroxide as an initiator, decomposition temperature was low and more stable radicals were produced so the needed reactive process temperature and residence time in twin extruder were low. Styrene monomer was used as primary coagent which is a monofunctional monomer and hydroquinone was used as secondary coagent which is a bifunctional monomer.
Results of tests showed that melt strength of polypropylene improved considerably. Then the pp foam was produced using azodicarbonamide blowing agent in the same twin extruder. The scanning electron microscopy (SEM) of the extruded PP foam revealed a uniform dispersion with closed cell morphology.