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Heterophasic Ethylene-Propylene Copolymers with Bimodal Dispersed Phase

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In the pursuit of toughness optimization, heterophasic ethylene-propylene copolymers were developed consisting of polypropylene matrix and two different ethylene propylene copolymers forming the dispersed phase (PP/EPC_1/EPC_2). The phase structure and mechanical properties of these materials were investigated as a function of the ethylene content of EPC_2 and the weight fraction ratio of the both elastomers. It was shown that by proper control of the above mentioned variables, materials with bimodal dispersed phase can be obtained. The bimodality was demonstrated both in the DMA relaxation spectra as an appearance of two distinct peaks characterizing the elastomer phase and in the AFM micrographs as a bimodality of particle size. The heterophasic ethylene-propylene copolymers with bimodal dispersed phase exhibit significantly higher impact strength and lower brittle-to-tough transition temperature than the conventional ones, so that a synergistic effect could be stated. The results were discussed from the viewpoint of matrix/dispersed phase compatibility, EPC_1/EPC_2 compatibility and dimension of the dispersed phase domains.