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Abstract

Investigations on Blowing Agents for the Processability of Foamed Parts by Rotational Molding Techniques †

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Polymeric foams consist of two distinct phases, a solid polymer matrix and a gaseous phase produced by the addition of one or more blowing agents. The production capability of polymeric foamed parts represents an important expansion of the range of properties in the plastics industry, and their unique properties broaden the variety of possible applications [1]. The production of polymeric foams is guided by the reduction in material consumption and weight, and their final performance. The density of foamed parts can be considerably reduced (the foams expand between 20 and 300 times), reducing the consumption of the polymeric matrix during processing. This feature is very attractive for industries using expensive materials since the cost of plastics can be up to 70% of the total production cost.

The rotational molding of foams consists of a modification of conventional rotational molding technology to produce plastic articles that are fully or partially foamed, with or without an outer non-foamed layer. The ability to produce hollow, large-size parts and the people's awareness due to the overconsumption of fossil fuels and environmental consciousness make the rotational molding of foamed parts an excellent opportunity for global commercialization [2].

This study aims to investigate the processability of different blowing agents to produce rotationally molded foamed parts. In this work, different chemical blowing agents, endothermic and exothermic, were first studied by thermogravimetric analysis in order to understand its thermal behavior, to select the proper processing conditions, and to determine their influence on the physical properties and morphology of the foamed parts. The endothermic blowing agent showed a much lower degree of expansion than the exothermic ones. The comparison between a commercial formulation and a MDPE/ADCA compound showed similar results in all studies conducted, namely its foam density, thickness, cell density, and average cell size. However, the processing temperature is also a critical factor for rotational molding cycle times. Therefore, the commercial formulation with a lower processing temperature was the most favorable.

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