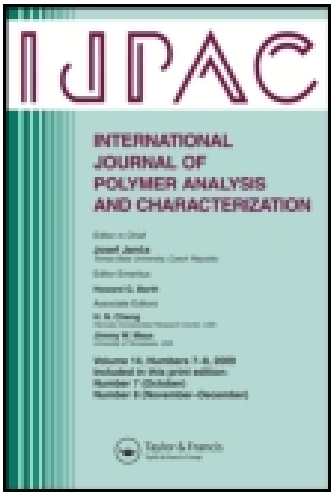

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Thermal Analysis of Micro- and Nano-Lignocellulosic Reinforced Styrene Maleic Anhydride Composite Foams

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The aim of this study was to measure the thermal properties of foamed nano/macro filler–reinforced styrene maleic anhydride (SMA) composites. SMA (66%) as a polymer matrix (10% maleic anhydride content) and various fillers including wood flour, starch, α-cellulose, microcrystalline cellulose and cellulose nanofibrils as reinforcing agents (30%) and lubricant (4%) were used to manufacture the composites in a twin-screw extruder. According to the thermogravimetric analysis (TGA) results, thermal degradation of all the foamed composites was found to be lower than that of SMA composites. The storage modulus values were negatively affected with a second time foaming (reprocessing [recycling] the initially processed composites a second time), as were loss modulus and T_g. As a result, second-time-foamed composite modulus values were lower than those of the foamed composites. According to the melt flow index (MFI) results, viscosity of the SMA was found to increase with the addition of fillers.

Keywords: Foams; Lignocellulosic fillers; Thermal stability; Viscoelastic properties

INTRODUCTION

Many studies have been made on thermal analysis of foamed polymers manufactured with different types of filler materials. Fillers can be utilized as both nucleating agents and reinforcing component. Use of various additives in foamed composites is often required to improve performance, aesthetics, processability, and productivity.[1] Use of natural fillers such as cellulosic particles has certain advantages over organic fillers, and properties of the fillers can be changed by either surface treatment or the use of coupling agents.[2–4] Fiber properties (orientation of fibers, natural properties of fiber) change with the use of coupling agents and may improve the properties of the composites manufactured using them.[5,6] Natural fillers are generally preferred for use in commodity plastics because of their easy processability.[7] Natural filler–reinforced composites can exhibit good performance regarding physical and mechanical properties and thermal behavior.[8,9] However, natural fiber–filled polymer composites typically

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