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STUDIES ON THE USE OF 1, 2-POLYBUTADIENE IN MICROCELLULAR SOLES

Jacob K. Varkey, N. M. Mathew and P. P. De

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The use of 1, 2-polybutadiene (1,2-PB) as a substitute for styrene-butadiene rubber (SBR)-high styrene resin in conventional microcellular (M.C) sole compounds was studied. Effects of concentration of 1,2–PB, filler combinations and concentration of blowing agent on technical properties of microcellular soles prepared from blends of natural rubber (NR) and 1,2-PB are discussed. Cell characteristics of seven selected vulcanizates were studied using a scanning electron microscope (SEM). It was found that blending of 1,2-PB with NR results in higher expansion, lightness, higher flex life and lower blooming in M. C soles. However, other technical properties are slightly inferior to those of M.C soles prepared using SBR-high styrene resin. A combination of china clay, precipitated silica and aluminium silicate in the ratio 60 : 30 : 15 is found to be an acceptable filler combination for NR/1,2-PB based M. C soles.

Key words –Natural Rubber, 1,2–Polybutadiene, Styrene-butadiene rubber, Blend, Microcellular sole.

Jacob K. Varkey (for correspondence) and N. M. Mathew, Rubber Research Institute of India, Kottayam-686 009, India and P. P. De, Rubber Technology Centre, Indian Institute of Technology, Kharagpur–721 302, India.

INTRODUCTION

Cellular soles are used in footwear mostly owing to their high strength to weight ratio. Conventionally a blend of natural rubber (NR) or styrene-butadiene rubber (SBR) and SBR - high styrene resin is used for making microcellular soles. Various types of polymers and their blends are used in footwear to achieve specific combination of properties such as lightness, wearing comfort, stiffness and durability. SBR-high styrene resins improve hardness, stiffness, abrasion resistance, etc. The acceptable range of properties required for rubber based M. C soles is specified in IS 10702–1985.

Supply of styrene for the production of SBR is reported to be decreasing (Elliot, 1974; Hall, 1974). Attempts have been going on to develop a substitute for SBR in general purpose applications, including microcellular soles, where use of styrene rich SBR is common. One of the most promising substitutes for SBR is 1,2-polybutadiene which possesses an overall balance of properties for many general purpose applications (Railsback and Stumpe, 1976). It exhibits thermoplastic elastomeric property due to stereoregular structure with a controlled degree of crystallinity. Resistance to abrasion, cut growth, flexing and ozone are reported to be better for 1, 2-PB compared to styrene - butadiene block copolymers and other polymers like ethylene vinyl acetate (Japan Synthetic Rubber Co., RB 810, RB 820).

The present work is an attempt to evaluate the suitability of 1, 2-PB as a substitute for SBR-high styrene resin in microcellular sole compounds.