PREPARATION AND EVALUATION OF SOLID LOW PROTEIN NATURAL RUBBER-PHASE I

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A process was developed for the preparation of high quality solid low protein natural rubber (LPNR-S) which could be scaled up to larger volumes of industrial level. In the new process,creaming or centrifuging of the latex employed in many of the deproteinization process were avoided. The ammoniated field latex was treated with a deproteinization mixture developed at Rubber Research Institute of India. The treated latex was coagulated after specified time with formic acid. The coagulum was creeped, washed and dried to get solid LPNR. The study showed that LPNR-S with nitrogen content of 0.07 to 0.1 per cent could be prepared from low ammonia latex within 24 h of deproteinization time. The same low nitrogen content could be achieved in LPNR-S within one hour of deproteinization time, using high ammonia latex and varying the composition of the deproteinization mixture.The optimized method reduces the protein content of LPNR-S by 85 per cent to that of the control. The LPNR-S prepared by new method had better raw rubber properties than commercial DPNR samples. The LPNR-S samples prepared through different methods were used to make corresponding LPNR-S composites. The impact of protein removal on technological properties and ageing behaviour of the LPNR-S composites at low and high antioxidant levels was evaluated.

Key words: Deproteinization, Enzymatic deproteinization, Low protein natural rubber, Solid deproteinized natural rubber

INTRODUCTION

There is continuous demand for solid low protein natural rubber (LPNR) for various engineering applications. The protocol developed by various tyre industries like Bridgestone and Sumitomo for LPNR (also reported as deproteinized natural rubber, DPNR) based tyre and tyre compounds are indications in this direction (Beezhold, 1996; Kondo, 2008; Kondo, 2012; Tanaka, *et al*., 2010). The above protocols have shown that the removal of proteins from natural rubber (NR) results in improved processability of LPNR compounds. The LPNR vulcanizates in general possess lower modulus, high modulus precision, lower creep, and better dynamic properties leading to better fuel economy than conventional NR vulcanizates. Recent studies have shown that the LPNR vulcanizates (Nor-Hidayathy *et al*., 2011) and their magnetic composites prepared by incorporating magnetic carbonyl particles (Ismail *et al*., 2017) possess better damping properties than convention NR. Use of NR in rubber shock absorbers to minimise noise

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