ENHANCED MECHANICAL AND DYNAMIC-MECHANICAL PROPERTIES OF BLENDS COMPOSED OF NITRILE BUTADIENE RUBBER AND IN-SITU SYNTHESIZED POLYURETHANE-UREA VIA PRECURSOR ROUTE

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ABSTRACT

Elastomeric blends possessing improved processing and performance characteristics are of considerable scientific and industrial importance. Interest in elastomeric blending is instigated by the low cost and time required to develop new materials with enhanced desired properties and extended performance. Accordingly, in this study blending of nitrile butadiene rubber (NBR) with in-situ synthesized thermoplastic polyurethane-urea (PUU) is investigated and highly reinforced NBR/PUU blends with improved mechanical and dynamic-mechanical properties are obtained. To follow this investigation, precursors to polyurethane-urea were utilized for the in-situ production and blending with NBR in internal mixer followed by the Fourier transform infrared spectroscopic analysis of blends to confirm in-situ PUU production. Blends up to 70/30 (NBR/PUU) weight ratio were prepared in internal mixer and compounded with vulcanizing ingredients in a two roll mill. The vulcanized blends of NBR with in-situ produced PUU showed remarkable improvement in stress-strain behaviour, abrasion loss and tear strength. Dynamic mechanical temperature-sweep analysis was performed to characterize the dynamic mechanical properties of blends which reflected concentration dependant enhanced storage modulus of blends. Further qualitative and quantitative characterization of blends was performed by differential scanning calorimetric analysis, thermal gravimetric analysis and transmission electron microscopic studies. The simultaneous in-situ thermoplastic polyurethane-urea production and blending with NBR produced a new material with interesting and improved property profile. Such blends can find utilization in areas requiring high damping characteristics and in applications demanding high modulus, strength, abrasion and tear resistance like belting, pump impellers etc.

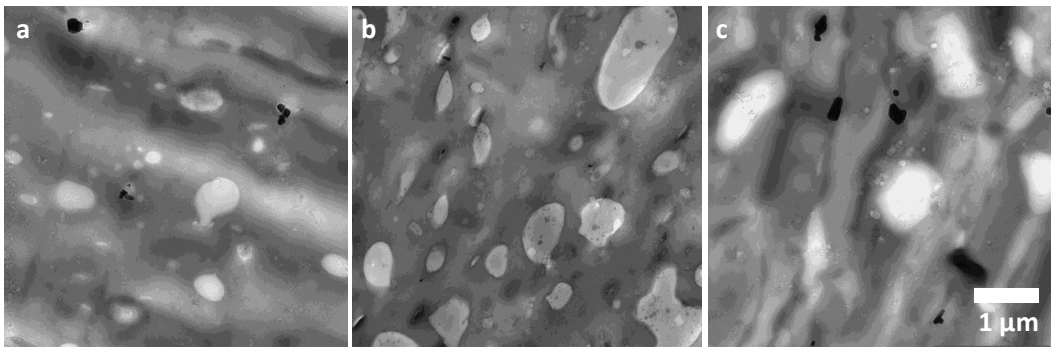

Fig. 1: TEM images show phase separated morphology of NBR/PUU blends **(a)** 90/10, **(b)** 80/20 and **(c)** 70/30