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Bio Based Thermoplastic Vulcanizates from Natural Rubber (NR/bioplastic): Tension Set and Processability

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Thermoplastic vulcanizates (TPV) is and PP or PE, with dynamically cured elastomer phase such as EPDM. The elastomer should be well dispersed in the polyolefin matrix which facilitates thermoplastic like processing of elastomer. The properties of TPV are mainly governed by properties of thermoplastic matrix and rubber phases including curing system used for dynamic vulcanization. As environmental problem has been an important issue, application of bioplastic in thermoplastic elastomer is interested. The blending of NR with various bioplastics has been studied in our work. Dynamic vulcanization of NR during melt blending of NR with various bioplastics was carried out. The systems included NR melt blended with poly(butylenes adipate-co-terephthalate, PBAT; polycaprolactone, PCL and poly(butylene succinate), PBS. The batch melt blending in an internal mixer were performed with various NR and bioplastics composition. Dynamic vulcanization of NR phase, using Luperox® 101 as curing agent, was also occurred in the mixer. Except for NR/PBS TPV system where dicumyl peroxide was used as curing agent. This will advantage for foam preparation in further foaming step. The results showed that NR/PBAT TPV with NR content as high as 70% possessed tension set less than 20% and elongation at break under tension was higher than 600%. Melt flow index of TPV obtained was in the range that could be extruded using twin screw extruder. For NR/PCL system at the same composition, the tension set was found at 20%, elongation at break under tension was as high as 1000%. This TPV system was also extrudable. Tension set for NR/PBS TPV system was found at about 30% and the elongation at break under tension was about 600%. From the mentioned basic properties of biobased TPV in our research, it presents that they could proposed the promising qualified TPV and advantage for the sake of biodegradability.