Abstract

Meta-pentadecenyl phenol popularly known as cardanol is a multifunctional additive in the rubber. It's phosphorylated derivative, phosphorylated cardanol prepolymer (PCP) is also a multifunctional additive whereas both cardanol and PCP are derived from CNSL (cashew nut shell liquid, a processed by-product of *Anacardium Occidentale* L.). In addition, the primary work is to graft these additives onto the NBR backbone main chain in order to functionalize the acrylonitrile butadiene rubber for improved processability and technical properties. Grafting of cardanol and its phosphorylated derivative PCP onto NBR and grafting of cardanol onto XNBR are carried out in the latex stage to imbibe multifunctional characteristics into these rubbers using BPO as a free radical initiator. Optimization of grafting parameters such as initiator concentration, cardanol and PCP concentration, reaction temperature and reaction time is carried out using Taguchi methodology, a component of design of experiments (DOE). All parameters of grafting have been optimized as per maximum percentage of grafting and grafting efficiency. The grafting of cardanol onto NBR and XNBR as well as grafting of PCP onto NBR were confirmed by UV-Visible and FTIR spectroscopy, NMR spectroscopy, and GPC. The plasticizing effect of cardanol and PCP is reflected by a low *Tg* for functionalized rubbers as revealed from DSC and DMA findings. Functionalized NBR nanocomposites containing nanoclay exhibited improved thermomechanical and physico-mechanical properties as well as better adhesion to different substrates, improved flame and fire retardancy, and improved biocompatibility as well as antibacterial properties over nanoclay loaded DOP plasticized NBR composite. Besides these, functionalized NBR nanocomposites exhibited greater resistance to air and oil ageing, improved dielectric properties, higher surface energy and high cure rate over DOP plasticized nanoclay containing NBR composite. Functionalized XNBR exhibited a low glass transition temperature, high cure rate, increased LOI, enhanced bactericidal effect and moreover, found to be biocompatible. Conclusion and summary containing all the topics covered under this study are placed at the end of the chapters.

Key words: NBR; XNBR; cardanol; PCP; functionalization; thermal stability; physico-mechanical; LOI; antibacterial; biocompatible