Hydroxyl-Terminated Saponified Natural Rubber Based on the H$_2$O$_2$/P25-TiO$_2$ Powder/UVC-Irradiation System

Natural rubber (NR), a long-chain hydrocarbon polymer mostly consisting of cis-1,4-polyisoprene units, has a high molecular weight (MW) and viscosity, enabling it to show excellent physical properties. However, NR has no reactive functional group, making it difficult to react with other molecules, especially in manufacturing processes. The functionalized low-molecular-weight NR (FLNR) is a requirement to disperse ingredients into the rubber adequately. Here, the FLNR was prepared by a photochemical degradation process under UVC-irradiation in the presence of H$_2$O$_2$ using P25-titanium oxide (TiO$_2$) powder as a photocatalyst. The optimum condition for the preparation of FLNR was the use of 2.0 g of TiO$_2$ powder per 100 g of rubber and H$_2$O$_2$ at 20% w/w under UVC-irradiation for 5 h. The hydroxyl groups were found on the NR chains due to the chain-scission of polyisoprene chains and hydroxyl radicals in the system. The weight average MW of NR decreased from 12.6 × 10$^5$ to 0.6 × 10$^5$ gmol$^{-1}$, while the number average MW decreased from 3.3 × 10$^5$ to 0.1 × 10$^5$ gmol$^{-1}$.

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Reference:
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