CONTINUOUS DYNAMIC LATEX COMPOUNDING RUBBER-CLAY NANOCOMPOSITES

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The demand for high-performance elastomers with superior reinforcement and high permeation resistance has driven the search for plate-like nanoscale fillers, in particular to smectic clays. In contrast to thermoplastic-clay nanocomposites there are difficulties in manufacturing elastomer-clay nanocomposite with high degree of intercalation or exfoliation. Excluding the academically oriented solution blending there has been no breakthrough achieved in melt blending. Promising techniques based on coagulation of rubber emulsions in aqueous clay suspensions under static conditions have recently been developed. In this work, Rubber-Montmorillonite nanocomposites were prepared by "Continuous Dynamic Latex Compounding" (CDLC). This technique, recently developed in our laboratory, permits an intensive intercalation of the polymer at very small residence times in a tubular flow reactor.

Three rubber latices with different polarity (NBR and XNBR with a acrylonitrile content of 34 e 30%, respectively, and SBR with a styrene content of 40%) were selected for this study. Suspensions aqueous of pristine Montmorillonite (MMT) were mixed with diluted rubber latex and carried out by technique "Continuous Dynamic Latex Compounding" (CDLC). The coagulation of the latex was performed with ethanol/$MgCl_2$. Nanocomposites with 10 phr of clay were crosslinked by using a standard cure system. Morphology was characterized by TEM. The dynamic mechanical properties and tensile properties were also investigated.

The processing conditions and the type of flow (elongational and turbulent) strongly affect the morphology of nanocomposites characterized by TEM. From micrographs it can be observed, that the polarity of the rubber, in the sequence: SBR < NBR < XNBR, increases the amount of intercalation in a controlled manner (Fig.1). The higher polarity of the rubber, that allows a better dispersion, affects the ultimate properties (Fig.2). From this results, we can say that Continuous Dynamic Latex Compounding (CDLC) can be used to obtain rubber-clay with superior properties. The polarity of the rubber latex facilitates intercalation and partly exfoliation.

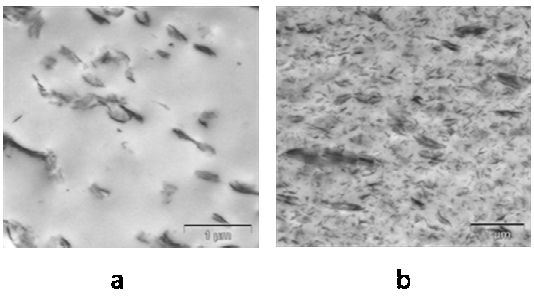

Figure 1. Morphology of SBR/MMT (a) and XNBR/MMT (b)

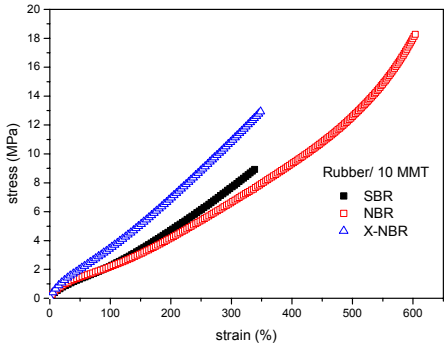

Figure 2. Stress-strain curves for clay-rubber nanocomposites ■SBR; □NBR; Δ XNBR

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- Neue Schichtsilikat-Nanokomposite
- Cellulose