# RHEOLOGY OF HIGH DENSITY POLYETHYLENE/HALLOYSITE NANOTUBES NANOCOMPOSITES

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The addition of rigid nanoparticles into polymer matrices is a well established approach to improve or modify functional properties of neat resins. In this frame, promising perspectives seem to be offered by tubular nanoclays from natural halloysites (HNTs). The inclusion of relatively low amounts of these fillers, chemically similar to kaolinite, to polymer matrices leads to nanostructured materials with improved mechanical properties, thermal stability and/or fire resistance behaviour.

Moreover, HNTs, having only few hydroxyl groups located on the surface with respect to carbon nanotubes, can be easily dispersed in a non-polar matrix such as polyolefins.

In this research, the effect of the matrix fluidity on the rheological behaviour of high density polyethylene (HDPE)/halloysite nanotubes compounds has been investigated. At this regard, nanocomposites based on three HDPE resins having Melt Flow Index equal to 2, 12 and 42 g/10 min and containing up to 10% by weight of HNTs were prepared by using a twin-screw lab extruder. All materials were analysed by oscillatory and steady state measurements taking neat matrices, processed under the same conditions of the hybrids, as the reference ones.

Dynamic evaluations indicated that, at low frequency, G' displays an incipient deviation, increasing with the filler content, with respect to the characteristic trend of the neat matrix only in the case of the more fluid resin. In all other cases, even at the largest filler fraction, curves of G' and G" are superimposed over the entire range of considered oscillating frequencies.

About the dynamic viscosity, a Newtonian plateau, clearly observed at low frequencies for systems based on the HDPE having the highest fluidity, disappears with increasing the matrix viscosity for the characteristic shear-thinning behaviour. In any case, the addition of HNTs results in an increase of this parameter especially at low frequencies and for the matrix with the lower fluidity: effect confirmed by steady-state capillary shear tests.