

Preferred orientation in modified clays polymer composite

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Composite Polycaprolactone (PCL) materials with different loads of natural clays were prepared employing two mixing techniques: a two-screw extruder and an intensive mixer (Brabeder type). Simultaneous Small and Wide-angle X ray Scattering (SAXS/WAXS) measurements were done in order to evaluate the structural characteristics and preferential orientation of the composites. On the one hand, the effect of the clay inclusion in the PCL lamellar structure was evaluated, and moreover, the clay interlayer distance was compared between composites.

Upon the modification of the clays with CBK, an anisotropic effect becomes noticeable in the 2D SAXS patterns recorded on Pilatus (Dectris) detector (Fig. 1), when the sample is analysed with the plane of the film parallel to the direction of the incident beam. Details of the geometry according to the synthesis.

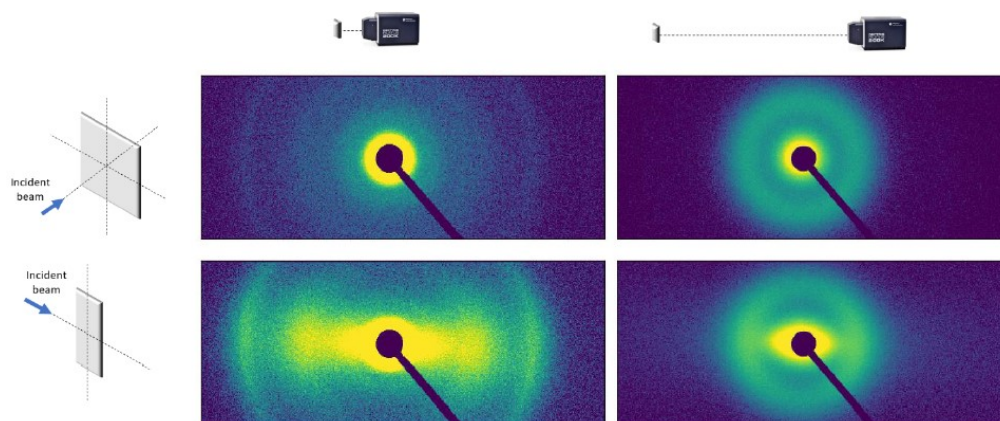


Figure 1. 2D SAXS images of a composite film PCL+bentonite+CBK, measured at two sample-to-detector distances, and two different film orientations.

For all cases, there were no changes in the PCL structure due to clay inclusion. For modified clays, in two of the three analysed systems, the clay interlayer characteristic peak shifts towards lower angles, corresponding to an increment in the distance from 1.3 to 1.7nm. And in all cases, a new peak appears at lower angles for the modified samples, attributed to an interlayer spacing distance of the nano sized clays of 2.7 - 2.9 nm, only for patterns of the samples placed parallel to the direction of the incident beam. Different loads yield different intensities in the most intense region, proportional to the amount of load.

Conclusions according to synthesis procedure and clay differences. Effect on applications/future perspective.

Keywords: clay polymer composite, preferred orientation, anisotropic SAXS pattern,