USING NANO-ADDITIVES TO INCREASE THE OXYGEN BARRIER OF POLYMERS

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The aim of this work is to increase the gas barrier of packaging polymers by using nano-scale additives. Barrier improvements by an order of magnitude have been reported by Cerisuelo *et al*. by using nanoclay. [1] The effect of nano-additives is expressed by a tortuous path for the permeant molecules, thus increasing the diffusion length. [2] Our aim is to find a suitable method for increasing oxygen barrier properties of polyamide thin film (used in the packaging industry) with nanoclay as additive. First tests using a twin-screw extruder and subsequent hot-pressing method have revealed the impact of nano-particles on the mechanical and barrier properties of polyamide. A modest, less than 10%, increase of the oxygen barrier was observed. Further investigation was carried out using a TEM and optical microscopy to assess the extent of dispersion and exfoliation of the nanoclay particles. Separate platelets as well as larger agglomerates were observed in the matrix.

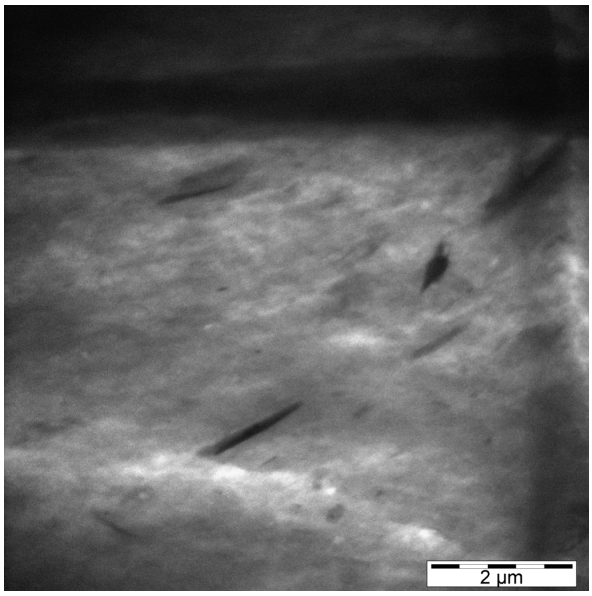

Fig.1 Polyamide-nanoclay composite film

The scale of dispersion and exfoliation of the nanoclay platelets is revealed to not sufficient for significant barrier increase. As an extension we propose investigating possibility of creating gas barrier via layer-by-layer coating with other polymers (such as PAM) [3], for future large scale testing and possible industrial use.

References

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