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Room: Ambassadeurs

NUCLEATION OF ISOTACTIC POLYPROPYLENE CRYSTALLIZATION IN MULTILAYERED SANDWICH NANOCOMPOSITES BY GOLD NANOPARTICLES WITH DIFFERENT MORPHOLOGIES

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Gold nanoparticles (AuNP) with sizes as small as 5 nm, has been shown to nucleate isotactic polypropylene (iPP) crystallization [1, 2]. The nucleation activity of AuNP was observed both in bulk and with recently developed sandwich method [2, 3]. In the case of chemically prepared, solution-synthesized AuNP [1] the nucleation activity seemed to be higher than in the case of physically prepared, vacuum-sputtered AuNP with the same size [2, 3].

In this study, we used the sandwich method [2, 3] in order to find a possible difference in nucleation activity among vacuum-sputtered gold nanoparticles with different average sizes. The improved sandwich method consists of reproducible preparation of thin iPP films (50, 100 and 300 μm), forming well-defined layer(s) of nano-nucleant (AuNP with specific size) between the films, thermal treatment of these sandwich composites and observation of nucleation activity by three independent methods: polarized light microscopy (PLM), differential scanning calorimetry (DSC) and two-dimensional wide-angle X-ray scattering (2D-WAXS).

All PLM, DSC and 2D-WAXS experiments confirmed our previous findings [2, 3] that the vacuum-sputtered AuNP do nucleate iPP, although their nucleating activity is extremely weak. Moreover, it has been demonstrated that the nucleating activity of vacuum-sputtered AuNP is only slightly influenced by their size. Parallel experiments with chemically synthesized gold nanocrystals [4] suggested that the nucleation activity was enhanced if the nanoparticles exhibited better-defined crystal facets.