Dynamics of Hyperbranched polymers in the bulk and close to surfaces

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Hyperbranched polymers have received much attention lately due to their multiple functionality, their nanosized dimensions, their cost-effective synthesis as compared to dendrimers, as well as their potential applications. Nevertheless, full understanding of the microscopic mechanisms that are responsible for the manifestation of their macroscopic properties is still missing. [1] On the other hand, polymer / layered silicate nanocomposites (PLSN) are considered as a new generation of composite materials due to their unique properties; especially intercalated nanohybrids, where polymer chains form a 1-2nm film within the inorganic galleries provide the opportunity to investigate polymer structure and dynamics close to surfaces. [2]

The dynamics of three different generations of a hyperbranched polyester polyol (Figure 1) was investigated, utilizing Broadband Dielectric Spectroscopy, for temperatures covering the regimes of both sub-T_g local processes and segmental (alpha-process) relaxation and the effects of the dendritic structure and of the generation were studied. Moreover, the three polymers were mixed with natural hydrophilic sodium montmorillonite, Na^+-MMT, to synthesize nanohybrids in a broad range of compositions between pure polymer and pure clay. In all cases, X-ray diffraction (XRD) measurements show that all hybrids exhibit intercalated structure whereas only excess polymer outside the galleries undergoes a glass transition. The dynamics of nanocomposites, with all chains confined in completely filled galleries, was investigated as well, showing both similarities and differences between the bulk and the confined polymers.

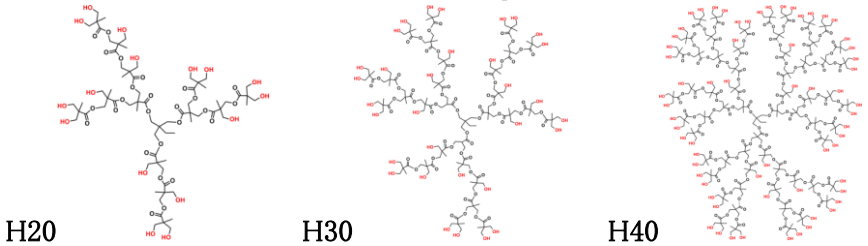

Figure 1: Three generations of the hyperbranched polyester polyol, Boltorn

References

[1] S. Fotiadou, C. Karageorgaki, K. Chrissopoulou, K. Karatasos, I. Tanis, D. Tragoudaras, S. H. Anastasiadis, *Macromolecules* **46**, 2842 (2013).

[2] K. Chrissopoulou, K. S. Andrikopoulos, S. Fotiadou, S. Bollas, C. Karageorgaki, D. Christofilos, G. A. Voyiatzis, S. H. Anastasiadis *Macromolecules* **44,** 9710 (2011).

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