

Functional Block Copolymers as Compatibilizers for Nanoclays in Polypropylene Nanocomposites

Jankova Atanasova, Katja ; Daugaard, Anders Egede; Stribeck, Norbert; Zeinolebadi, Ahmad; Sari, Morteza Ganjaee; Potarniche, Catalina-Gabriela; Jensen, Erik Appel; Christiansen, Jesper de Claville; Hvilsted, Søren

Publication date:
2011

[Link back to DTU Orbit](#)

Citation (APA):

Jankova Atanasova, K., Daugaard, A. E., Stribeck, N., Zeinolebadi, A., Sari, M. G., Potarniche, C-G., ... Hvilsted, S. (2011). Functional Block Copolymers as Compatibilizers for Nanoclays in Polypropylene Nanocomposites. Abstract from Nordic Polymer Days 2011, Stockholm, Sweden.

DTU Library

Technical Information Center of Denmark

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Functional Block Copolymers as Compatibilizers for Nanoclays in Polypropylene Nanocomposites

Katja Jankova¹, Anders E. Daugaard¹, Norbert Stribeck², Ahmad Zeinolebadi², Morteza Ganjaee Sari², Catalina-Gabriela Potarniche³, Erik Appel Jensen³, Jesper de Claville Christiansen³, Søren Hvilsted¹

Danish Polymer Centre, Department of Chemical and Biochemical Engineering, Technical University of Denmark, DK-2800 Kgs. Lyngby¹; Institute for Technical and Macromolecular Chemistry, University of Hamburg, Bundesstr. 45, DE-20146 Hamburg²; Department of Mechanical and Manufacturing Engineering, Aalborg University, DK-9220 Aalborg³
kaj@kt.dtu.dk

With the aim of creating tough nanocomposites (NC) [1] based on polypropylene (PP) and nanoclay (NCl) in the framework of the 7th EU program NANOTOUGH we have designed amphiphilic block copolymers utilizing Atom Transfer Radical Polymerization (ATRP) [2]. They consist of a hydrophobic block of Kraton L-1203 from Kuraray Co., Japan with molecular weight 7000 and PDI=1.05, and a hydrophilic block of quaternized dimethylaminoethyl methacrylate (DMAEMA). The size of the hydrophilic block was varied, which increasingly caused better dispersibility of the block copolymer in water. This was essential for the exchange of the Na⁺ ions of the used NCl (3.8 wt.-% aq. dispersion of montmorillonite, MMT from Laviosa Chimica Mineralia, Italy) by the synthesized charged block copolymer, which was performed in water. Modified nanoclays with 2.5 to 8.0 wt.-% of the quaternized PEB-*b*-PDMAEMA₃₅ were prepared. The exfoliation and intercalation was studied by XRD. Rheological measurements of either aq. solutions of the charged block copolymers or PP master batches with various amounts of the modified MMT were performed. Tensile tests of NCs show similar behavior, but SAXS reveals change in the nanostructure. According to the structural data derived from SAXS [4] the MMT acts like a nucleating agent to the PP that starts competitive nucleation of crystallites in the PP during manufacturing. Consequently, the PP crystallites in the composites are small and imperfect. This means that the self-reinforcement of the PP (by its crystallites) is replaced by alien-reinforcement (of the MMT). Furthermore, the results from the impact strength and cyclic test of the prepared PP nanocomposites [3] are promising.

References

- [1]. B. Chen, J.R.G. Evans. *Soft matter* **2009**, *5*, 3572-3584.
- [2]. K. Jankova, X. Chen, J. Kops, W. Batsberg. *Macromolecules* **1998**, *31*, 538-541; *Macromol. Rapid Commun.* **1999**, *20*, 219-223.
- [3]. A.D. Drozdov, A.-L. Høeg Lejre, J. de C. Christiansen. *Composites Science and Technology* **2009**, *69*, 2596-2603.
- [4]. N. Stribeck, U. Nöchel, S. S. Funari, T. Schubert, A. Timmann. *Macromol. Chem. Phys.* **2008**, *209*, 1992-2002.