

Synthesis and Characterization of Cation-Containing and Hydrogen Bonding Supramolecular Polymers

Shijing Cheng

Dissertation submitted to the faculty of the Virginia Polytechnic Institute and State
University in partial fulfillment of the requirements for the degree of
Doctor of Philosophy
in
Chemistry

Timothy E. Long, Chair
Richey M. Davis
Robert B. Moore
Judy S. Riffle
S. Richard Turner

August 26, 2011
Blacksburg, Virginia

Keywords: phosphonium, ammonium, nucleobase, reversible addition-fragmentation
chain transfer polymerization, nitroxide mediated polymerization, ionomers, hydrogen
bonding, molecular recognition, non-covalent interactions, Michael addition, ionic
liquids, polyacrylates

Copyright © 2011, Shijing Cheng

Chapter 3: Ionic Aggregation in Phosphonium-Containing ABA Triblock Copolymers: Controlled Radical Polymerization of Phosphonium Ionic Liquids

(Shijing Cheng, Frederick L. Beyer, Brian D. Mather, Robert B. Moore, and Timothy E. Long*, *Macromolecules*, *published*) Reproduced in part with permission from *Macromolecules*. Copyright 2011 American Chemical Society.

3.1 Abstract

Phosphonium ion-containing acrylate triblock (ABA) copolymers were synthesized using nitroxide mediated radical polymerization. The polymerization of styrenic phosphonium-containing ionic liquid monomers using a difunctional alkoxyamine initiator, DEPN₂, afforded an ABA triblock copolymer with an *n*-butyl acrylate soft center block (DP~400) and symmetric phosphonium-containing external reinforcing blocks (DP<30). Two phosphonium monomers with different alkyl substituent lengths enabled an investigation of the effects of ionic aggregation of phosphonium cations on the physical properties of ABA block copolymer ionomers. Subsequently, the thermomechanical properties and morphologies of these materials were compared to a noncharged triblock copolymer analog with neutral polystyrene external blocks. Shortening the alkyl substituents on the phosphonium cation enhanced the hydrophilicity of tributyl-4-vinylbenzyl phosphonium chloride (BPCI) relative to trioctyl-4-vinylbenzyl phosphonium chloride (OPCI). In both cases, phosphonium cations promoted microphase-separation and thermoplastic elastomer performance for the OPCI- and BPCI-containing triblock copolymers compared to a less well-defined, microphase



RightsLink®

[Home](#)[Account Info](#)[Help](#)**Title:**

Phosponium-Containing ABA Triblock Copolymers: Controlled Free Radical Polymerization of Phosponium Ionic Liquids

Author:

Shijing Cheng et al.

Publication: Macromolecules**Publisher:** American Chemical Society**Date:** Aug 1, 2011

Copyright © 2011, American Chemical Society

Logged in as:
Shijing Cheng[LOGOUT](#)

PERMISSION/LICENSE IS GRANTED FOR YOUR ORDER AT NO CHARGE

This type of permission/license, instead of the standard Terms & Conditions, is sent to you because no fee is being charged for your order. Please note the following:

- Permission is granted for your request in both print and electronic formats.
- If figures and/or tables were requested, they may be adapted or used in part.
- Please print this page for your records and send a copy of it to your publisher/graduate school.
- Appropriate credit for the requested material should be given as follows: "Reprinted (adapted) with permission from (COMPLETE REFERENCE CITATION). Copyright (YEAR) American Chemical Society." Insert appropriate information in place of the capitalized words.
- One-time permission is granted only for the use specified in your request. No additional uses are granted (such as derivative works or other editions). For any other uses, please submit a new request.

[BACK](#)[CLOSE WINDOW](#)

Copyright © 2011 [Copyright Clearance Center, Inc.](#) All Rights Reserved. [Privacy statement.](#)
Comments? We would like to hear from you. E-mail us at customercare@copyright.com