Non-Aqueous Dispersion (NAD) Polymerisation-Based Synthetic Route to Hypercrosslinked Polymer With High Specific Surface Areas

Norhayati Abdullah[1] and Peter A.G. Cormack[2]

Abstract

Hypercrosslinked polymer microspheres with high specific surface areas were prepared successfully by exposing reactive, gel-type polymer precursors to a Friedel-Crafts catalyst. The lightly crosslinked gel-type polymer precursors were synthesised by non-aqueous dispersion (NAD) polymerisation in microsphere form, and were used subsequently in hypercrosslinking reactions. Extensive microporosity was generated in the products, leading to remarkably high inner specific surface areas of up to ~1,500 m^2/g. SEM and BET spectroscopy were used to monitor the course of the hypercrosslinking reactions.

Keywords

Hypercrosslinked polymers, non-aqueous dispersion polymerisation, polymer microspheres.

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[1]Faculty of Chemical and Natural Resources Engineering, Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300 Gambang, Kuantan, Pahang, Malaysia

[2]WestCHEM, Department of Pure and Applied Chemistry, University of Strathclyde, Thomas Graham Building, 295 Cathedral Street, Glasgow, G1 1XL, Scotland (UK).

Corresponding Author:

Norhayati Abdullah, Faculty of Chemical and Natural Resources Engineering, Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300 Gambang, Kuantan, Pahang, Malaysia.

Email: yatiabdullah@ump.edu.my

Introduction

Hypercrosslinked polymers are highly crosslinked synthetic macromolecules formed upon the exhaustive intramolecular crosslinking of linear or lightly crosslinked polymeric precursors in a thermodynamically 'good' solvent. The first hypercrosslinked polymer was introduced by Davankov *et al*. in the 1960s[1] which hypercrosslinked polystyrene networks were prepared by exhaustive crosslinking of linear polystyrene (PSt) chains using a Lewis Acid generated 'external' *bis*-electrophile. Hypercrosslinked polymers are considered to be a new generation of porous polymers because they are distinct from conventional porous polymers in terms of their small pore sizes (<2 nm), ultra-high surface specific areas (>1000 m^2/g), and their unusual capability to uptake both polar and non-polar solvents. These unusual properties lead to significant