Study of some parameters affecting on the inverse emulsion polymerization of acrylamide

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Master (Msc) Thesis , 2009

Abstract

The present work aims at preparation and characterization of polyacrylamide. This study consists of four parts. The first part contains a general introduction, the methods of preparation of polyacrylamide, their properties, also, some applications of acrylamide polymer. The second part includes the recent works in the inverse emulsion homo, and copolymerization of acrylamides. The third part includes the materials used and the methods of the preparation of polyacrylamide by inverse emulsion polymerization. The forth part is concerned with the results and discussion of the obtained data and this is divided into two main sections:- A. kinetic study of inverse emulsion polymerization of acrylamide:- This part includes the kinetic study of the inverse emulsion polymerization of acrylamide and it is subdivided into two main sections.

B. Morphology study of the inverse emulsion polymerization of acrylamide:- This part includes the morphology study of the inverse emulsion polymerization of acrylamide using water soluble redox system initiator (potassium persulphate / sodium bisulphate). The second section includes the kinetic study of the inverse emulsion polymerization of acrylamide using oil soluble initiator (dibenzoyl peroxide). The results indicate that the rate of polymerization increases with the increase of the concentration of the initiator, monomer and emulsifier. The rate of inverse emulsion polymerization of acrylamide monomer was found to be dependent on the initiator, monomer and emulsifier concentration to the powers: In case of redox initiator system the powers are 0.75, 1.49 and 0.59, respectively; while in case of dibenzoyl peroxide initiator the powers are 0.6, 1.35, and 0.66, respectively. It can be possible to represent the equation of the rate of polymerization for redox initiator system and for dibenzoyl peroxide initiator as follow: Rp= K [I] 0.75 [M] 1.49 [E] 0.56 and Rp= K [I] 0.6 [M] 1.35 [E] 0.66, respectively. The overall activation energy value for the inverse emulsion polymerization of acrylamide using redox initiator system was found to be 45.27 KJ/mol, while for dibenzoyl peroxide it was found to be 79.22 KJ/mol. B. Morphology study of the inverse emulsion polymerization of acrylamide:- This part includes the morphology study of the inverse emulsion polymerization of acrylamide under different conditions using potassium persulphate/sodium bisulphite as redox-initiator system and calculating the volume average diameter and the number of particles per unit volume of water of the inverse emulsion polymerization of acrylamide. The results indicate that the volume average diameter of the polymer particles increases with the increase in the concentration of the initiator, monomer and water amount in water/oil ratio, while the number of the particles per unit volume decreases. Moreover, the increases of the concentration of emulsifier and the rate of stirring per minute, lead to a decrease in the volume diameter of the polymer particles and an increase in the number of the particles.

Keywords

inverse emulsion polymerization; acrylamide; redox initiation system; kinetic studies; morphology.