Fluid Phase Equilibria 411 (2016) 93–100

Contents lists available at ScienceDirect

Fluid Phase Equilibria

journal homepage: www.elsevier.com/locate/fluid

# Hyperbranched polyester polyacids and their binary systems with surfactants for doxorubicin encapsulation

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ARTICLE INFO

*Article history:*
Received 2 October 2015
Received in revised form
10 December 2015
Accepted 12 December 2015
Available online 13 December 2015

*Keywords:*
Boltorn H hyperbranched polyester polyols
Hyperbranched polyester polyacids
Polymer/surfactant binary systems
Doxorubicin
Drug encapsulation

ABSTRACT

Doxorubicin fixation by hyperbranched polyester polyol Boltorn H acid derivatives and their binary systems in the presence of a surfactant (Brij-35, Triton X-100) was investigated. Doxorubicin fixation degree nonlinearly depends on the number of acid groups in the polyester polyacid. Polyacid/surfactant binary systems fix up to 60% of doxorubicin from the solution.



## 1. Introduction

There are a great number of effective drugs that are rarely used in clinical practice due to their high toxicity. The anticancer drugs are of special importance among them. Their toxicity mainly caused by their low bioavailability [1]. Therefore, the drug encapsulation systems development is one of the most popular and difficult scientific areas in modern medical chemistry.

All currently existing targeted delivery systems can be divided into two types: delivery systems with constant and dynamic composition. The first one include targeted delivery systems based on the synthetic polymers [2], such as PAMAM [3], PEI [4], PLA [5], and natural: DNA, RNA [6]. The major advantage of polymer systems with constant composition is rigid carrier-substrate bond and the consistance of composition. The drawbacks of such systems are large molecular weight and low water solubility. Systems with dynamic composition include micellar [7], liposomal [8], exosomal systems and emulsions [9]. These systems demonstrate good water solubility, but they lose effectiveness with water dilution and are difficult to remove from the body.

Besides, one of the major goals of the targeted delivery systems development is the carrier and target substrate complementarity [10]. Modern carriers for targeted delivery systems should possess the following characteristics: large molecular and solubilization capacity, suitable size, modification simplicity, peculiar surface properties, targeting capacity and low toxicity [11–13]. Dendrimers, hyperbranched polymers (HBP) and star polymers possess the abovementioned characteristics and are the most suitable for the targeted delivery systems development [14,15].

Another systems for drugs encapsulation are molecular hydrogels, for example nanofibrous hydrogels [16]. The application of such hydrogels provides specific drugs binding [17] and the pH controlled release [18]. However, the key drawback of the encapsulation systems based on hydrogels is the impossibility of their intravenous injection.

However, star polymers do not provide firm retention of the substrate because of the excessively large distance between branches. The number of terminal groups in star polymers is lower than in dendrimers or HBPs. Solubilization of the large substrates

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http://dx.doi.org/10.1016/j.fluid.2015.12.023
0378-3812/