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Authors: Carlos Alberto Ramírez Barragán, Emma Rebeca Macías Balleza, Lorena García Uriostegui, Jesús Angel Andrade Ortega, Guillermo Toríz, Ezequiel Delgado



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# Rheological characterization of new thermosensitive hydrogels formed by chitosan, glycerophosphate, and phosphorylated $\beta$ -cyclodextrin

Carlos Alberto Ramírez Barragán<sup>a</sup>, Emma Rebeca Macías Balleza<sup>b</sup>, Lorena García Uriostegui<sup>c</sup>, Jesús Angel Andrade Ortega<sup>a</sup>, Guillermo Toríz<sup>a</sup>, and Ezequiel Delgado<sup>a1</sup>

<sup>a</sup> Centro de Investigación en Biomateriales, Departamento de Madera, Celulosa y Papel, Centro Universitario de Ciencias Exactas e Ingenierías, Universidad de Guadalajara, Guadalajara, Jalisco, México.

<sup>b</sup> Departamento de Ingeniería Química, Universidad de Guadalajara, Boulevard Marcelino García Barragán # 1451, Guadalajara, Jalisco. 44430, México

<sup>c</sup> CONACyT – Departamento de Madera Celulosa y Papel, Universidad de Guadalajara, Carretera Guadalajara-Nogales Km. 15.5, Zapopan, Jalisco 45110, México.

## Highlights

- A novel thermosensitive hydrogel chitosan/phosphorylated  $\beta$ -cyclodextrin was prepared.
- The hydrogel formulation allowed including the double of  $\beta$ -cyclodextrin (ratio 1:2).
- The maximum ratio of chitosan/ phosphorylated  $\beta$ -cyclodextrin was is 1:1.5.
- The gelation time for the system was > 1 minute, suitable for injected solutions.
- The new hydrogel had stronger mechanical properties than CS/ $\alpha\beta$ GP/ $\beta$ CD system.

## Abstract

A novel thermosensitive hydrogel consisting of phosphorylated  $\beta$ -cyclodextrin ( $\beta$ CD-PH),  $\beta$ -cyclodextrin ( $\beta$ CD) and chitosan was prepared by embedding  $\beta$ CD and  $\beta$ CD-PH, into the well-studied chitosan/ $\alpha\beta$ -glycerophosphate system (CS/ $\alpha\beta$ GP). The relevance of this work is the use of  $\beta$ CD-PH to partially substitute  $\alpha\beta$ GP as the gelling agent. The role of  $\beta$ CD and  $\beta$ CD-PH on the rheological properties of hydrogels, gelation time, and gelation temperature were investigated. The gelation time for all the samples (straightforward CS/ $\alpha\beta$ GP, CS/ $\alpha\beta$ GP/ $\beta$ CD, and CS/ $\alpha\beta$ GP/ $\beta$ CD-PH) was less than a minute at 37 °C, which is suitable for biomedical applications. The gelation temperature for hydrogel CS/ $\alpha\beta$ GP/ $\beta$ CD-PH increased linearly with the addition of  $\beta$ CD-PH within the interval 31.8 to 37.3 °C, at ratios CS: $\beta$ CD-PH of 1:0.5, 1:1, 1:1.5 and 1:2 (w/w). The hydrogel thus obtained has potential applications in dual drug delivery (hydrophilic and hydrophobic).

## Keywords

*Thermosensitive hydrogel, phosphorylated  $\beta$ -cyclodextrin, chitosan,  $\alpha\beta$ -glycerophosphate.*

## Abbreviations

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<sup>1</sup>Corresponding author. Tel.: +52 (33) 36820110; fax: +52 (33) 36820643.  
E-mail address: ezedelfor@gmail.com

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