

## Accepted Manuscript

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PII: S0144-8617(18)31058-0  
DOI: <https://doi.org/10.1016/j.carbpol.2018.08.139>  
Reference: CARP 14036



To appear in:

Received date: 30-5-2018  
Revised date: 25-8-2018  
Accepted date: 30-8-2018

Please cite this article as: Wang G-Hai, Zhang L-Ming, Electroactive polyaniline/silica hybrid gels: controllable sol-gel transition adjusted by chitosan derivatives, *Carbohydrate Polymers* (2018), <https://doi.org/10.1016/j.carbpol.2018.08.139>

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## Electroactive polyaniline/silica hybrid gels: controllable sol-gel transition adjusted by chitosan derivatives

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### Highlights

- 1. The sol-gel transition of electroactive gels can be controlled by polysaccharide derivatives.
- 2. There is no organic solvent in the process of prepared hybrid gels.
- 3. Good biocompatibility and low toxic for the encapsulated enzyme or protein.
- 4. Good redox electroactivity. The polyaniline could be well compatible with the silica matrix.

Abstract: In this study, the electroactive hybrid gels with controllable sol-gel process were fabricated based on the water soluble polyaniline complex and water soluble silica precursor.  $\beta$ -cyclodextrin grafted on chitosan (CSCD) acted as a template, a new route for the synthesis of water soluble polyaniline complex (PA@CSCD) was designed by in-situ polymerization. Then, the hybrid silica gels without severe shrinkage were prepared by mixing PA@CSCD complex with water soluble precursor (tetrakis(2-hydroxyethyl)orthosilicates, THEOS). By dynamic rheological measurements, it was found that PA@CSCD complex could trigger and accelerate the sol-gel transition of the silica precursor. The gelation time could be largely shortened with the increase of PA@CSCD complex amount. By SEM observation, the PA@CSCD complex could be well compatible with the silica matrix. Moreover, the hybrid gels showed the good redox electroactivity, which could be successfully applied in a HRP-based biosensor.

Keywords: polyaniline; chitosan derivatives; hybrid gels; controllable sol-gel transition; electroactivity.

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