

The review of doctoral thesis

## "Preparation of gold nanoparticles using oxidized polysaccharides"

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This thesis is focused on preparing gold nanoparticles with using oxidized polysaccharides. These materials have been prepared with future applications in mind: biomedical materials and devices for wound healing, analytical application of Surface-enhanced Raman scattering (SERS). The following objectives were set in this thesis:

- 1) To understand the mechanism of reduction occurring during the synthesis of gold nanoparticles (AuNPs) and the relationship between polysaccharide structure and nanoparticles properties
- 2) To elucidate the effect of reaction conditions on the final shape, size, and stability of AuNPs
- 3) To explore the application potential of the AuNPs prepared in this way, especially in the field of catalysis and spectroscopic properties, particularly the SERS effect.
- 4) To test the possibility of deposition/adsorption of such prepared AuNPs on suitable matrices using aldehyde/carboxyl groups on their surface and find out application potential for these composite materials.

After a thorough reading of the dissertation it can be said that the objectives have been met and the PhD student has successfully dealt with the problems related to this research area.

The thesis is written as brief review of this scientific field or state of the art and short conclusion of experimental work and discussion. This type of dissertation was probably chosen (not as monography) due to fact that student published three articles related to dissertation's aims (two papers in *Carbohydrate Polymers* and one in *International Journal of Biological Macromolecules*). From this perspective, her scientific work has undergone peer review, as one would expect in the rigorous peer-review process of reputable journals.

The theoretical part could be more focused on dissertation aims with more in-depth analysis of the related literature. However, this part is written clearly and consistently and the reader can be drawn into the subject of the dissertation if he wishes.

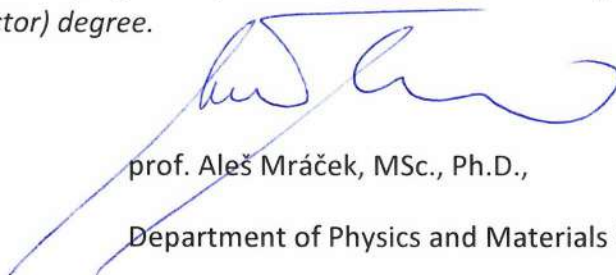
In the experimental section, the procedures for sample preparation, materials and analysis are thoroughly described and the reader can navigate the text well.

Although the results have already been reviewed in internationally respected journals, I would like to take the liberty of having a few comments or questions that the PhD student should answer:

1) Considering the variety of polysaccharides used (cellulose, hyaluronic acid, dextran, alginate) and their respective oxidized forms for the synthesis of gold nanoparticles, how do the intrinsic properties of these different polysaccharides (such as molecular weight, degree of oxidation, and functional groups) specifically influence the size, shape, and catalytic efficiency of the resulting gold nanoparticles? This question is particularly relevant given the varied applications of these nanoparticles in catalysis and surface-enhanced Raman scattering (SERS). I am mainly interested in your opinion or hypothesis.

2) In your study on the synthesis of gold nanoparticles using oxidized polysaccharides, you explored various applications of these nanoparticles. Could you discuss how the surface chemistry of the gold nanoparticles, altered by the specific oxidized polysaccharides used, influences their biocompatibility and effectiveness in biomedical applications, such as drug delivery or imaging? Chemical or physical surface properties is crucial for their potential use in medical treatments and diagnostics.

*Dissertation written by Ing. Alžběta Důbravová fully meets the requirements for this type of thesis within the meaning of Act No. 137/2016 Coll. on Higher Education. The student has demonstrated the ability of creative work and independent scientific activity. Therefore, I recommend to accept this thesis for further proceedings and after successful defence to award the Ph.D. (philosophiæ doctor) degree.*



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