Posudek práce

předložené na Matematicko-fyzikální fakultě
Univerzity Karlovy

☒ posudek vedoucího ❑ posudek oponenta
❑ bakalářské práce ☒ diplomové práce

Autor/ka: Bc. Veronika Červenková
Název práce: Plasma methods for modification and preparation of biopolymers
Studijní program a obor: Physics of Condensed Matter and Materials (N0533A110016)/ Physics of Condensed Matter and Materials
Rok odevzdání: 2023

Jméno a tituly vedoucího/oponenta: Mgr. Daniil Nikitin, Ph.D.
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Odborná úroveň práce:
☒ vynikající ❑ velmi dobrá ❑ průměrná ❑ podprůměrná ❑ nevyhovující

Věcné chyby:
☒ téměř žádné ❑ vzhledem k rozsahu přiměřený počet ❑ méně podstatné četné ❑ závažné

Výsledky:
☒ originální ❑ původní i převzaté ❑ netriviální kompilace ❑ citované z literatury ❑ opsané

Rozsah práce:
☒ veliký ❑ standardní ❑ dostatečný ❑ nedostatečný

Grafická, jazyková a formální úroveň:
☒ vynikající ❑ velmi dobrá ❑ průměrná ❑ podprůměrná ❑ nevyhovující

Tiskové chyby:
☒ téměř žádné ❑ vzhledem k rozsahu a tématu přiměřený počet ❑ četné

Celková úroveň práce:
☒ vynikající ❑ velmi dobrá ❑ průměrná ❑ podprůměrná ❑ nevyhovující

Slovní vyjádření, komentáře a připomínky vedoucího/~~oponenta~~:
Bc. Veronika Červenková started her master's studies at the Department of Macromolecular Physics in the academic year 2021/2022 and her research activities were connected with the modification and preparation of biopolymeric materials by plasma-based methods. This topic was formulated taking into account the personal motivation of the student to solve the problems of sustainability and the development of novel biodegradable materials. Since Bc. Červenková had a practical background working with dielectric barrier discharge in the frame of her Bachelor's thesis, the atmospheric pressure plasma was chosen as the main scientific instrument of biopolymers processing.
The atmospheric pressure plasma jet discharge was used as the major tool and the student learned to operate it very quickly. Moreover, during the characterization of the samples Bc. Červenková became familiar with a wide range of methods including capillary viscosimetry, gel permeation chromatography, NMR spectrometry, UV-Vis spectrometry, FTIR-IR spectrometry, atomic force microscopy, and nanoindentation. I would emphasize that most of the measurements were performed by the graduate herself or in close cooperation with experts. Bc. Červenková even attended the 2 days visit to the University of South Bohemia, where she participated in antibacterial tests of her samples. I would like to highlight the strong motivation, good theoretical background, and high learning ability of the graduate that allowed her to perform high-quality research work and to finalize most of the planned experiments in time. I believe that the obtained experience will be useful in her future scientific career.
Regarding the Diploma thesis, it is well-written and structured. The work contains a brief introduction to the issue of bio-polymers and their application, a description of non-thermal plasma, and its use for materials processing. This part was followed by the Materials and Methods, where a detailed description of every technique was given. The first chapter of Results and Discussion is devoted to the plasma processing of sodium alginate solutions aiming to induce re-polymerization and cross-linking processes without a significant influence on the chemical composition of the initial material. These solutions were used for the fabrication of bio-polymeric foils with advanced mechanical properties, which were characterized in detail in the second part. I would emphasize that the graduate performed good analytical work and proposed several mechanisms of re-polymerization responsible for the observed effects. Moreover, a very promising antibacterial effect of plasma-processed alginate foils was revealed, which was improved by the addition of a natural bactericidal agent – essential oil. The last chapter of the Thesis is devoted to the characterization of water-soluble chitosan produced by the plasma-solution treatment, which is a prospective natural fertilizer. Bc. Červenková performed a huge amount of work and obtained original results, which are planned to be published as a scientific paper in the international impacted journal.
I am glad to recommend the Diploma thesis of Bc. Červenková to the defense with an excellent grade.

Případné otázky při obhajobě a náměty do diskuze: none.

Práci
☒ doporučuji
❑ nedoporučuji
uznat jako diplomovou/~~bakalářskou~~.

Navrhuji hodnocení stupněm:
☒ výborně ❑ velmi dobře ❑ dobře ❑ neprospěl/a
Místo, datum a podpis vedoucího/~~oponenta~~: Prague, 23.5.2023, Mgr. Daniil Nikitin, Ph.D.