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Abstract of the doctoral thesis: “Development and characterization of chitin-chitosan 3D constructs”

This work focuses on 3D chitin scaffolds obtained from selected sponges of Verongiida order (Demospongiae: Porifera) and their deacetylation to chitosan with the aim to create novel hybrid composite material previously never reported. Sponges from this order possess the unique ability to regenerate their chitin-based skeletons, making them a sustainable source of pre-fabricated 3D chitin scaffolds including on the large scale. Their naturally ready-to-use structure offers numerous opportunities for further functionalization. In this work, for the first time, chitin scaffolds of sponges origin were deacetylated using concentrated sodium hydroxide to create a microporous composite containing both chitin and chitosan without loss of 3D architecture. The chitin core retains its structural integrity, while the chitosan surface of the composite offers functional versatility due to its reactivity and solubility, enabling applications, such as catalysis. Furthermore, the mechanical properties of chitin scaffolds from selected sponges species were also investigated. It was also demonstrated for the first time, that a 3D α-chitin-based scaffold from sponges can be dissolved in a dilute lithium hydroxide solution without any chemical changes. This work presents a comprehensive analysis of the analytical data, discusses the physicochemical and structural properties of the chitin scaffolds under study, and represents their potential applications.