

Silk fibroin/orange peel composite foam: an efficient adsorbent material for water remediation

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A novel highly porous adsorbent is prepared combining orange peel powder with silk fibroin, a biopolymer derived from *Bombyx mori* cocoons. Agricultural waste peels have been studied as promising bio-sorbents in water remediation for the removal of dyes and heavy metal ions due to their chemical composition[1], and the orange peel incorporation in the silk fibroin matrix allows to overcome the difficulties caused by the recovery of the ground sorbent during wastewater treatment. The carbon dioxide assisted critical point drying is used to fabricate a stable composite foam starting from alcogels obtained with the addition of methanol in order to induce the self-assembly of ordered β -sheet structures in the protein[2]. The successful embedding of 50%_{w/w} of orange peel with respect to the silk fibroin has allowed the reaching of a maximum adsorption capacity of 113 mg/g for the model molecule methylene blue. The mechanism involved has been identified as a physical adsorption process. The use of orange peel as bio-sorbent introduces the possibility to valorize this agricultural peel waste and to reuse it to obtain sustainable adsorbent materials.

References

- [1] A. Bhatnagar, M. Sillanpää, and A. Witek-Krowiak, *Chem. Eng. J.*, 270 (2015) 244-271
- [2] X. Hu, Q. Lu, D. L. Kaplan, and P. Cebe., *Macromolecules*, 42 (2009) 2079-2087

Figures

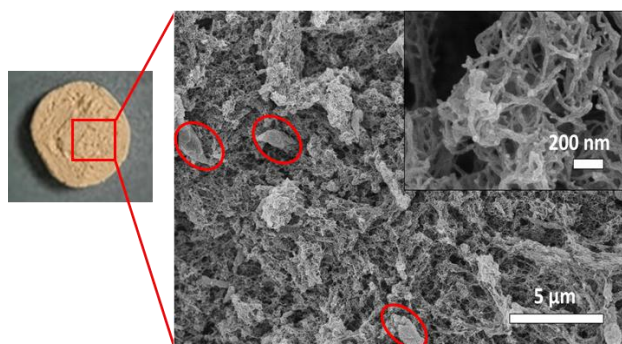


Figure 1: Picture and HR-SEM image of Silk Fibroin/Orange Peel foam. The presence of orange peel powder is indicated in the red circles

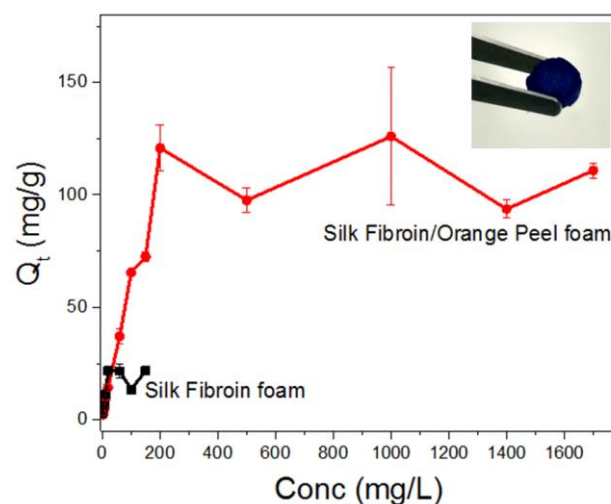


Figure 2: Effect of the initial methylene blue concentration on the adsorption capacity after a contact time of 24 h for the Silk Fibroin/Orange Peel and the Silk Fibroin foams