

Halloysite, Sepiolite and Cellulose Nanofibers based Bio-Hybrid Materials for Health Applications

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This work represents a contribution to the design of a hybrid material based on biocompatible components. In particular, two inorganic solids belonging to the class of clays, namely halloysite and sepiolite, were combined with cellulose nanofibers in order to prepare homogeneous, flexible, yet strong films through the solvent casting method under controlled temperature and pressure conditions (Figure 1).¹ The role of each component and the resulting effects on the final properties of the material were highlighted. The interactions of the inorganic and the organic counterparts were investigated and their co-assembly allowed to tune the macroscopic, structural and morphological aspect together with the mechanical performance. The hierarchical porosity and the different surfaces of the material were exploited for drug delivery applications. Indeed, halloysite nanotubes were loaded with two model drugs, salicylic acid and ibuprofen, and the release kinetics were studied. Overall, the reported protocol allowed to control the release profile of drugs and antimicrobial assays showed that the bio-hybrid composite is efficient in inhibiting the bacterial growth, opening a versatile path for developing other related organic–inorganic materials of potential interest in diverse application fields.

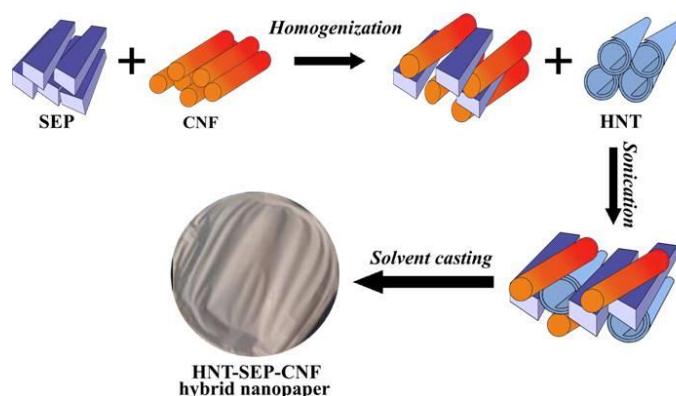


Figure 1. Scheme of the procedures followed for the integration of HNT, SEP and CNF components leading to HNT–SEP–CNF hybrid nanopapers.

References

- [1] Lisuzzo, L., Wicklein, B., Dico, G. L., Lazzara, G., del Real, G., Aranda, P., & Ruiz-Hitzky, E. Functional biohybrid materials based on halloysite, sepiolite and cellulose nanofibers for health applications. *Dalton Transactions*. 2020, 49(12), 3830–3840.