Silver(I) coordination polymer meets chia seed mucilage based film - antimicrobial performance and evaluation of permeability trends through human skin *in vitro*

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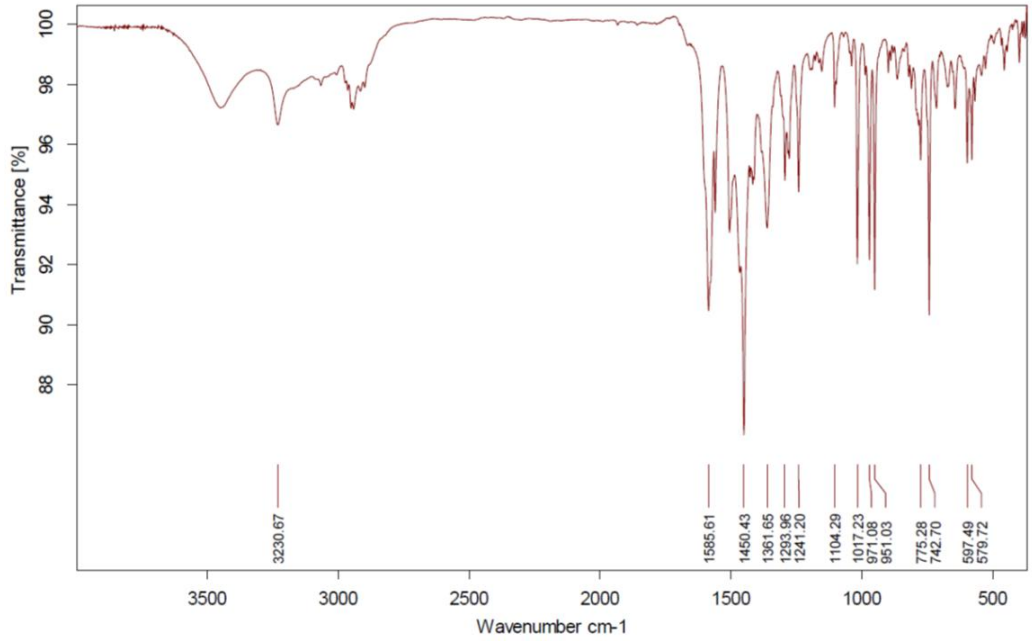

Figure S1 FT-IR spectrum of compound **1**.

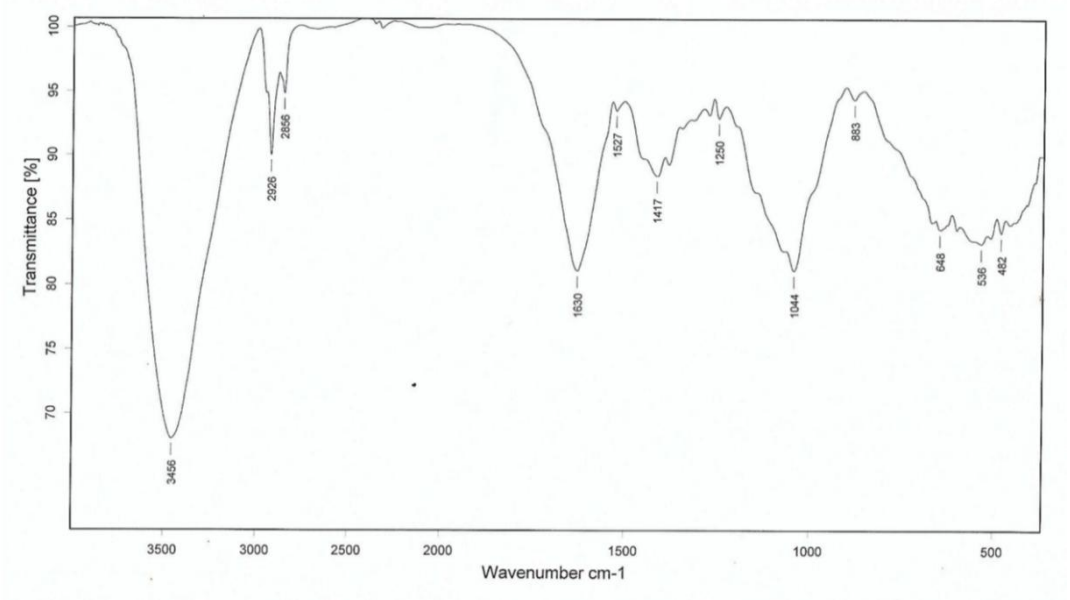

Figure S2 FT-IR spectrum of dry **CSM** extracted from chia seeds.

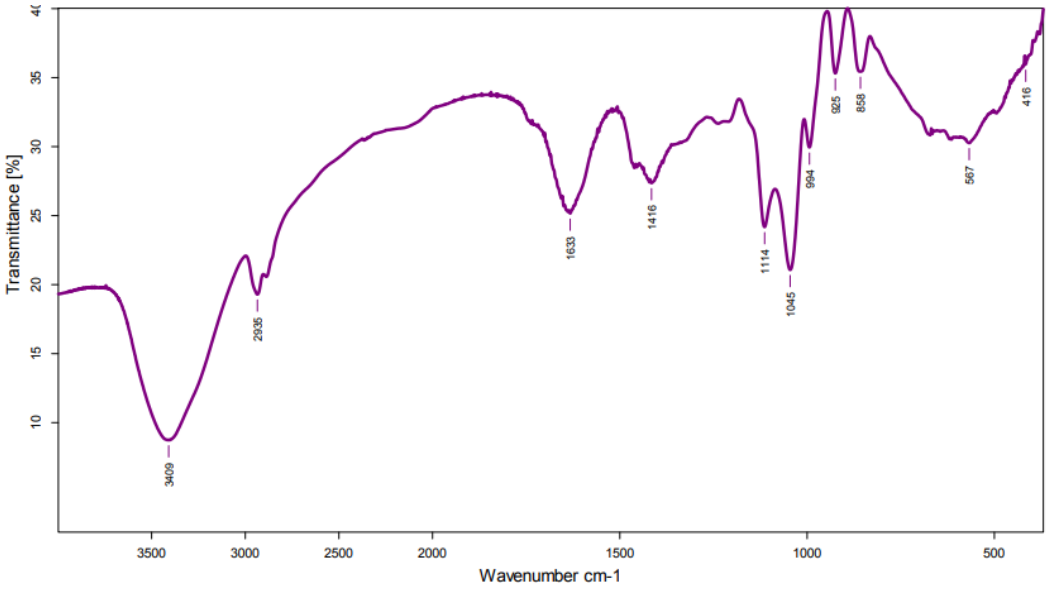

Figure S3 FT-IR spectrum of **CSM** film.

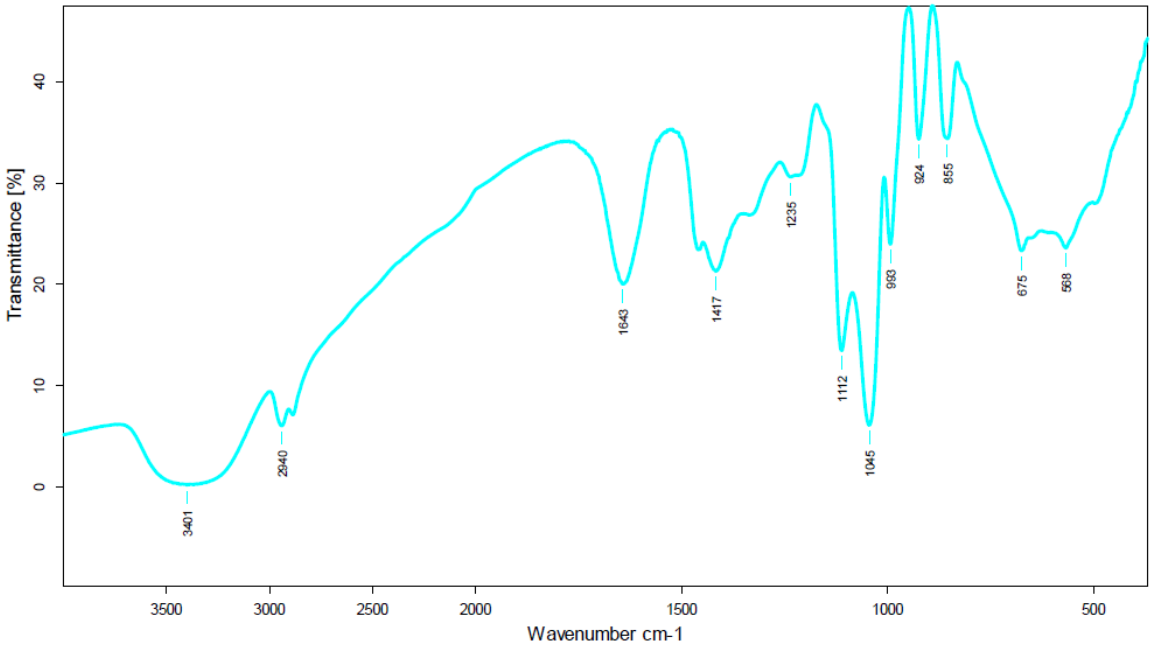

Figure S4 FT-IR spectrum of **composite 1@CSM** material.

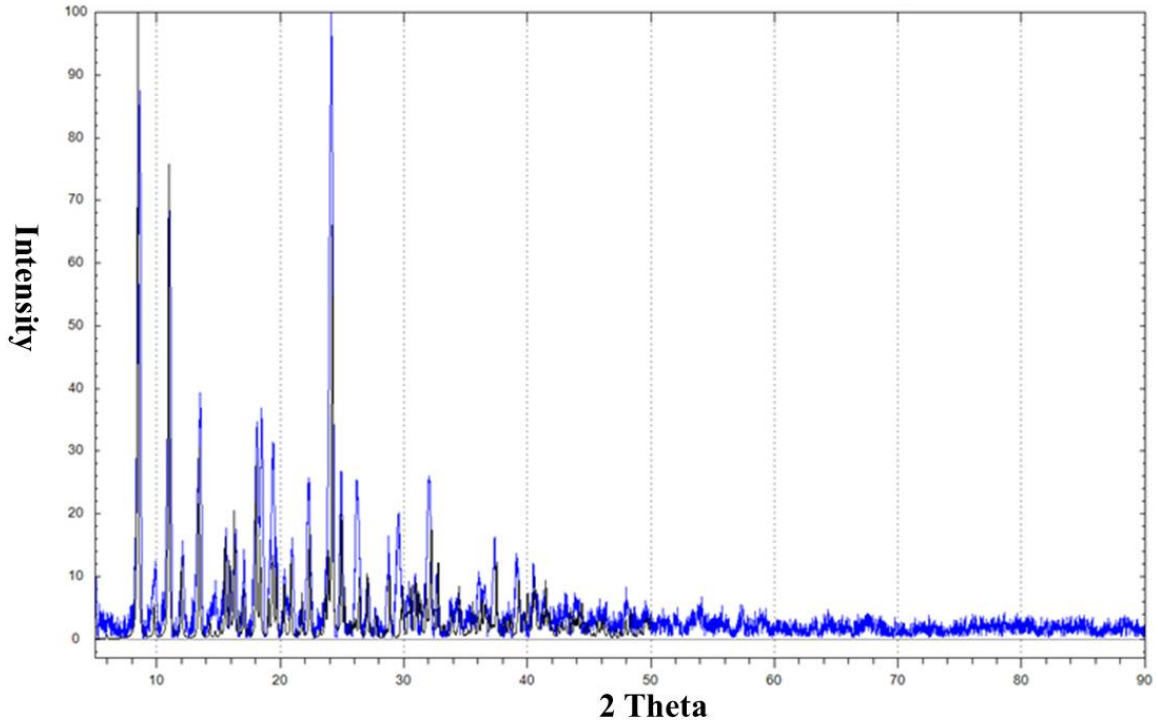

Figure S5 Comparison of PXRD patterns of compound **1** calculated from the crystallographic X-ray data (black) with bulk product (blue).

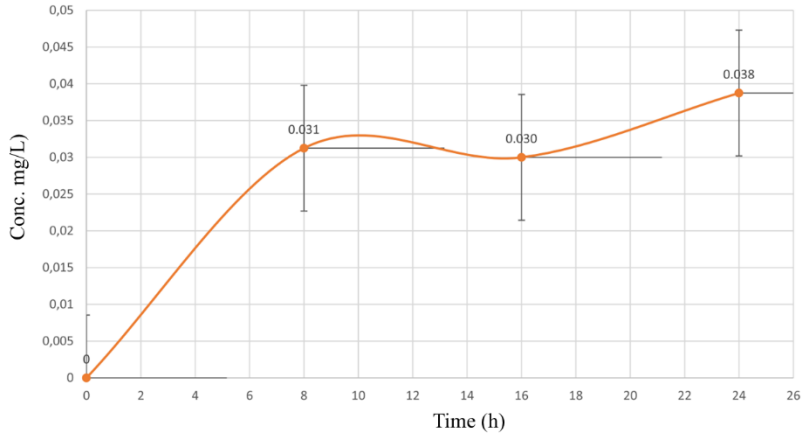

Figure S6 Silver ion release profile in psychological-like conditions from **composite 1@CSM** (1) (n=3).

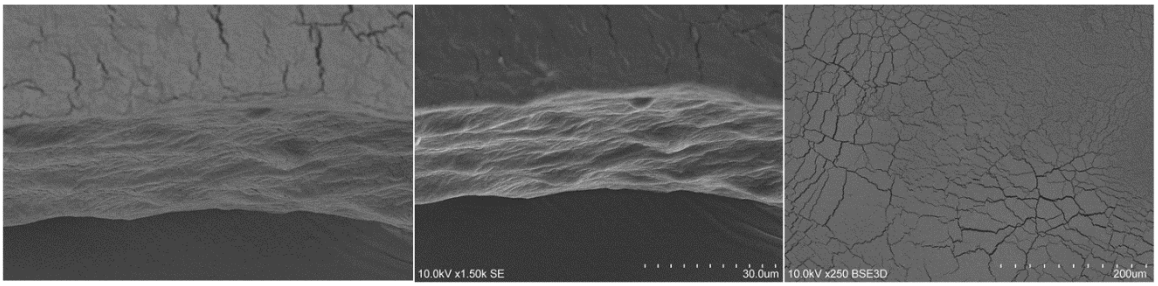

Figure S7 Scanning electron microscopy microphotographs of **CSM** film.

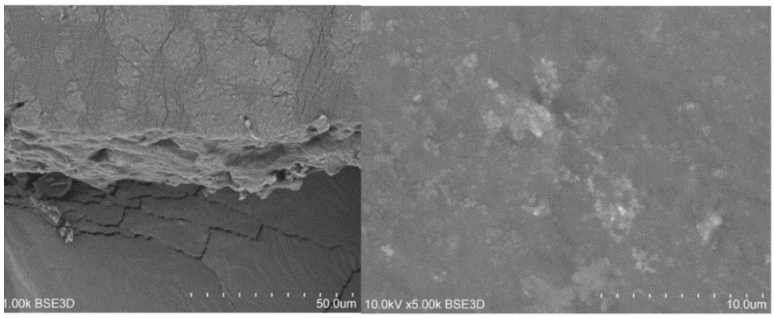

Figure S8 Scanning electron microscopy microphotographs of **composite 1@CSM**.

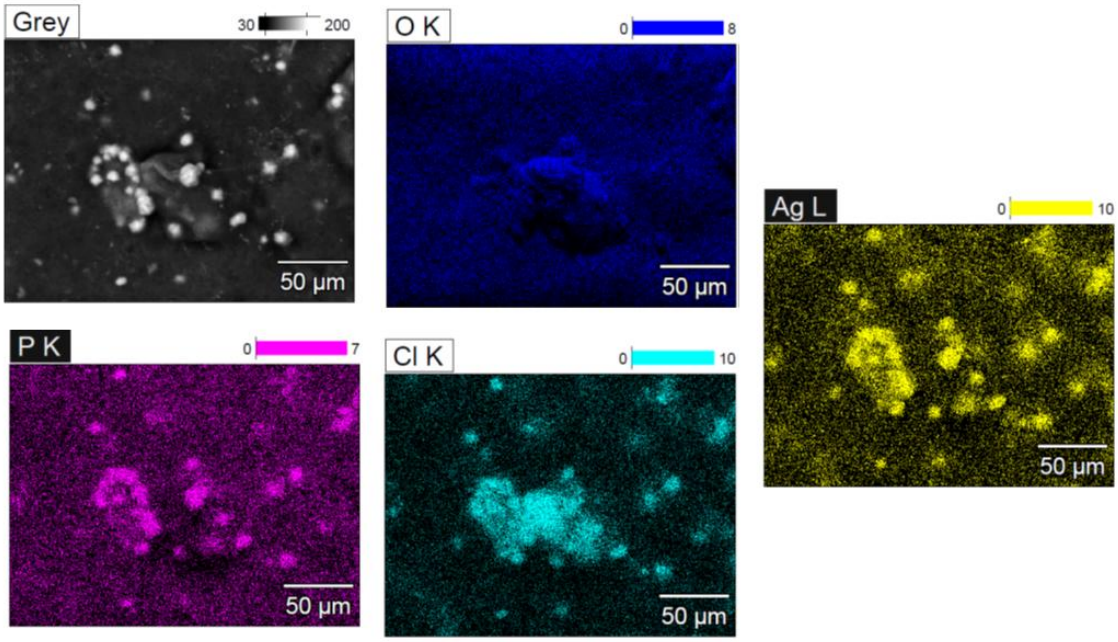

Figure S9 SEM-EDS microphotographs of **composite 1@CSM**.

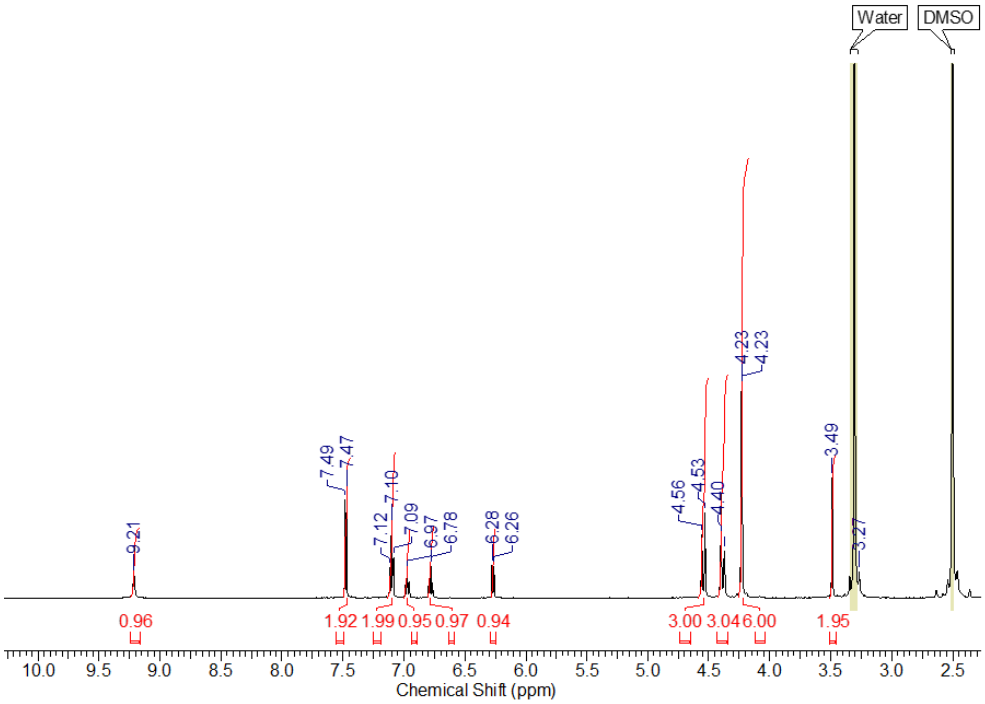

Figure S10 ^{1}H NMR spectrum of **1** in DMSO-d_6.

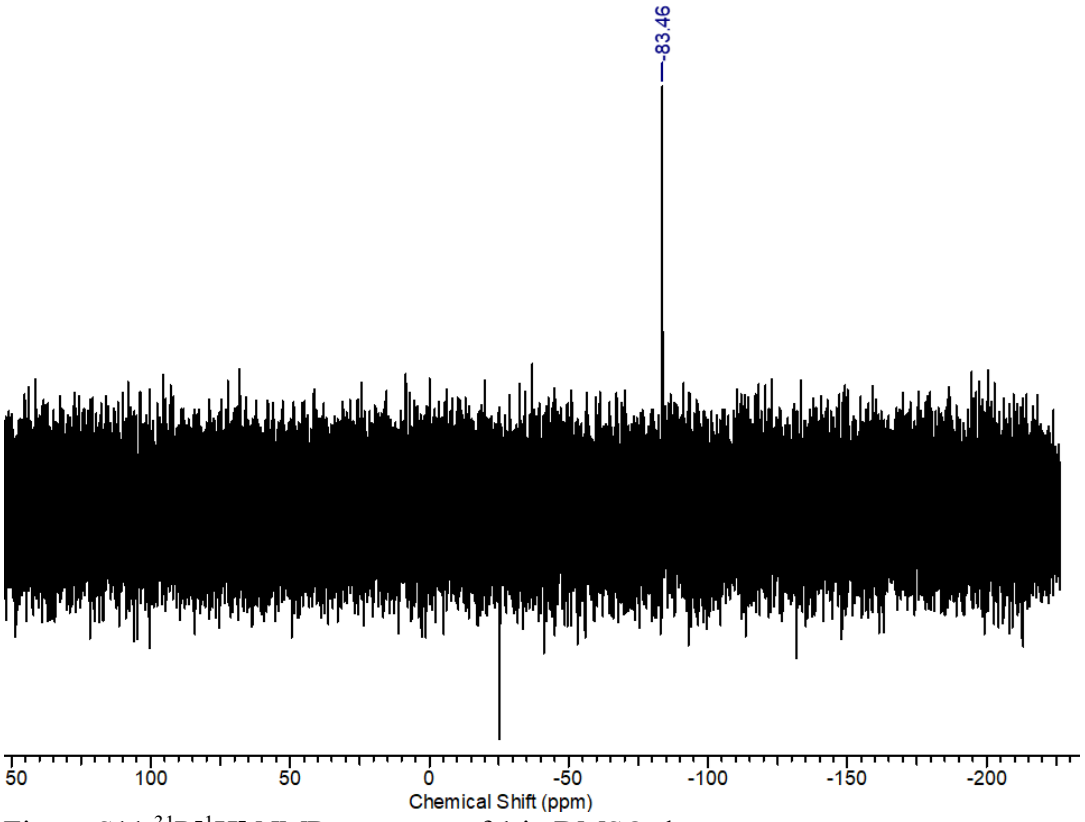

Figure S11 ^{31}P[^{1}H] NMR spectrum of **1** in DMSO-d_6

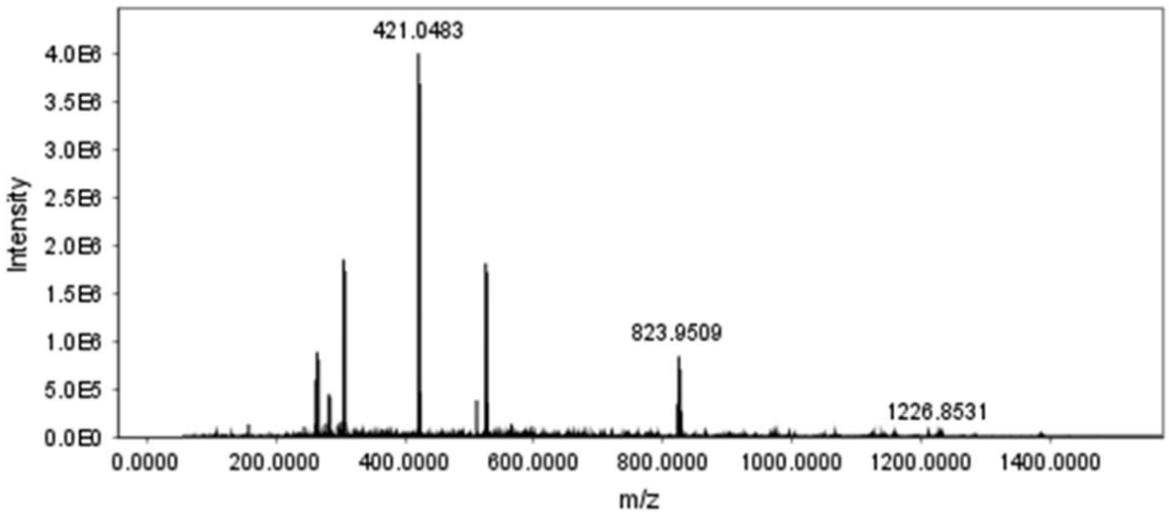

Figure S12 ESI-MS spectrum of compound **1**.[2]

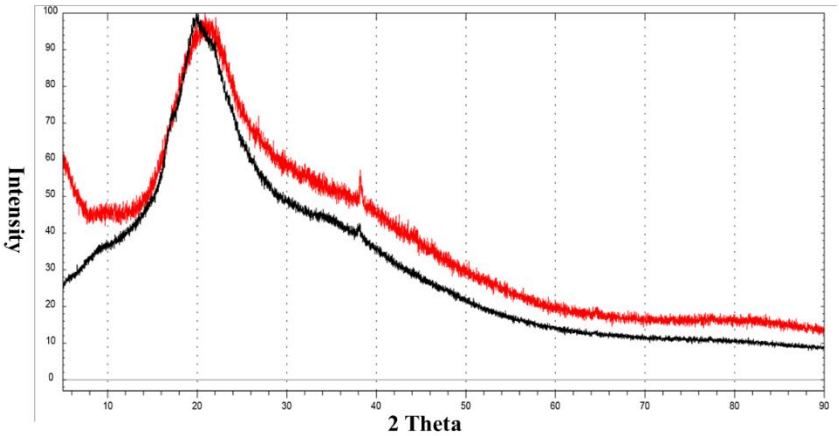

Figure S13 Comparison of PXRD patterns of **CSM** (red) and **composite 1@CSM** (black) materials.[1]

Materials and methods

M1. Measurement of the degree of swelling and solubility

First, the discs (n=3) with a mass of 10 mg, a thickness of 0.33 mm, and a diameter of 8mm of the tested films were placed in a cylinder with distilled water (3 mL) and monitored for 10 min, 1h, 6h, 12h and 24h. The absorbed volume remains constant between 1 hour and 24 hours. Therefore, the obtained films' swelling and water absorption capacities (**CSM** and **1@CSM**) were measured after 24 hour. Discs with a diameter of 8 mm were soaked in distilled water at room temperature for 24 hour. After soaking, the water was removed, and the samples were gently dried with filter paper in order to eliminate the excess of H_2O.[21] The following formula was used to calculate the degree of swelling (DS):

$$DS = \frac{\text{Mw}-\text{Mo}}{\text{Mo}} \text{ x } 100\%$$

Mw-weight of samples after soaking in H_2O, Mo- weight of the sample before the soaking in H_2O.

M2. Water retention capacity

The water retention capacity (WRC) was assessed utilizing discs of uniform weight and dimensions. These discs were submerged in water for 24h. Then the discs were carefully removed from the water and gently dried using filter paper. Subsequently, they were allowed to dry at room temperature for a period of 24 hours and reweighted.[21] The following formula was applied to calculate the WRC.

$$WRC\ (\%) = \frac{\text{Mw}}{Mo}\ x\ 100$$

Mw-weight of discs after 24h on air , Mo- weight of the sample before the soaking in H_2O.

M3. Thickness and porosity

The digital caliper was employed to assess the thickness of the CSM and **1@CSM**, discs (n=3). Each disc, with a diameter of 8 mm, was measured at three distinct points, and the average thickness was subsequently calculated. The disc of **CSM**, **1@CSM**, discs (n=3) with known thickness and weight were inserted into the flask with 5 mL of ethanol. Their weights were reweighed after 5 min. The porosity was calculated based on the equation presented below. Mw-mass of dry disc, Mo-initial mass of the disc, vo-volume of the sample, ρo- density of the ethanol

$$\%\ porosity = \frac{\text{Mw} - \text{Mo}}{v0\rho o}\ x\ 100$$

The ICP-OES measurements were made on an iCAP 7400 ICP-OES emission spectrometer (model DUO, Thermo Scientific, manufactured in 2018), with sample excitation at the temperature of inductively coupled argon plasma (approx. 10,000K). The spectrometer is equipped with an ASX 280 autosampler (Teledyne), a classic pneumatic concentric nebulizer was used for nebulization. Solutions containing Ag^+ in the range of 0.01 - 1.0 mg/L were used for calibration. The emission was recorded for the 328.068 nm and 338.289 nm lines in the

axial plasma observation mode, three times for each solution. The instrument limits of detection (LoD) are: LoD (328.068nm) = 0.0026mg/L and LoD (338.289nm) = 0.0022mg/L

References

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3. S. Heuckeroth, T. Damiani, A. Smirnov, O. Mokshyna, C. Brungs, A. Korf, M J. D. Smith, P. Stincone, N. Dreolin, L. F. Nothias, T. Hyötyläinen, M. Orešič, U. Karst, P. C. Dorrestein, D. Petras, X. Du, J.J.J. van der Hooft, R. Schmid, Pluskal, MZMine, *T. Nat Protoc*. 2024, **19**, :2597-2641.