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Electronic Supplementary Information(ESI)

for

Advanced microscopy and spectroscopy reveal the adsorption and clustering of Cu (II) onto TEMPO-oxidized cellulose nanofibers †

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S1. Zeta-potential of TOCNF and TOCNF+Cu in nitride acid solution at different pH values.



Fig. S1 Zeta-potential of TOCNF and TOCNF+Cu in nitride acid solution at different pH values.

S2.

Table 1. Raman intensity variations of wood and TOCNF around wavenumber 1590-1595cm-1 before and after adsorption at 2mg/L CuSO4 solution.

Materials	Peak position (cm ^{.1})	Before adsorption Raman intensity (a.u.)	Peak position (cm ^{.1})	After adsorption Raman intensity (a.u.)
Wood flour	1595	88.5	1595	33.8
TEMPO 0.6	1590	94.2	1595	24.3
TEMPO 1.2	1590	173.0	1595	22.9

S3. Schematic structure of the TOCNF unite with COO- groups both in dry and liquid medium.

Carboxyl group can show resonance structures, in which the oxygen atom of hydroxyl group contains positive charge, which is not a stable condition, hence can lose bonded hydrogen atom in the form of proton and convert in carboxylate ion, (S3, a). While in liquid phase, in the carboxylate anion the C–O bonds are of equal length (between a double and a single bond) and the two contributing structures have equal weight in the hybrid, so we assume that the structure (S3, b) is the same as the structure (S3, c).



Fig. S3 Schematic structure of the TOCNF unite with COO- groups both in dry and liquid medium.