# Role of cellulose micro and nano crystals in thin film and support layer of nanocomposite membranes for brackish water desalination

**Mohammed Kadhom [1,*], Noor Albayati [2], Suhaib Salih [3], Mustafa Al-Furaiji [4], Mohamed Bayati [5,6] and Baolin Deng [5]**

[1] Department of Prostheses, Al-Dour Technical Institute, Northern Technical University, Saladin, Iraq
[2] Department of Science, College of Basic Education, University of Wasit, Azizia, Wasit, Iraq
[3] Department of Chemical Engineering, University of Tikrit, Saladin, Iraq
[4] Environment and Water Directorate, Ministry of Science and Technology, Baghdad, Iraq
[5] Department of Civil and Environmental Engineering, University of Missouri, Columbia, MO 65211, USA
[6] Department of Environmental Engineering, University of Tikrit, Saladin, Iraq
* Correspondence: muhammed.ak@ntu.edu.iq or makbq6@mail.missouri.edu; Tel.: +964-7725-943-915

**Table S1.** CNCs gel characterizations.

| ***Parameter*** | ***Value*** | ***Units*** | ***Test Method*** |
|---|---|---|---|
| Solids content | 8% | w/w | |
| Crystallinity index | 80% | | Segal method |
| Crystal length | 100-150 | nm | TEM |
| Crystal diameter | 9-14 | nm | TEM |
| Hydrodynamic diameter | 117.2 | nm | DLS (dynamic light scattering) |
| Surface area | ≈ 250 | $m^2/g$ | |
| Zeta potential | -30.2 | mV | DLS |
| Carboxyl content | 0.129 | mmol/g | Conductivity titration + FTIR Image |
| pH | 5.599 | | |
| Conductivity | 317 | µS/cm | |

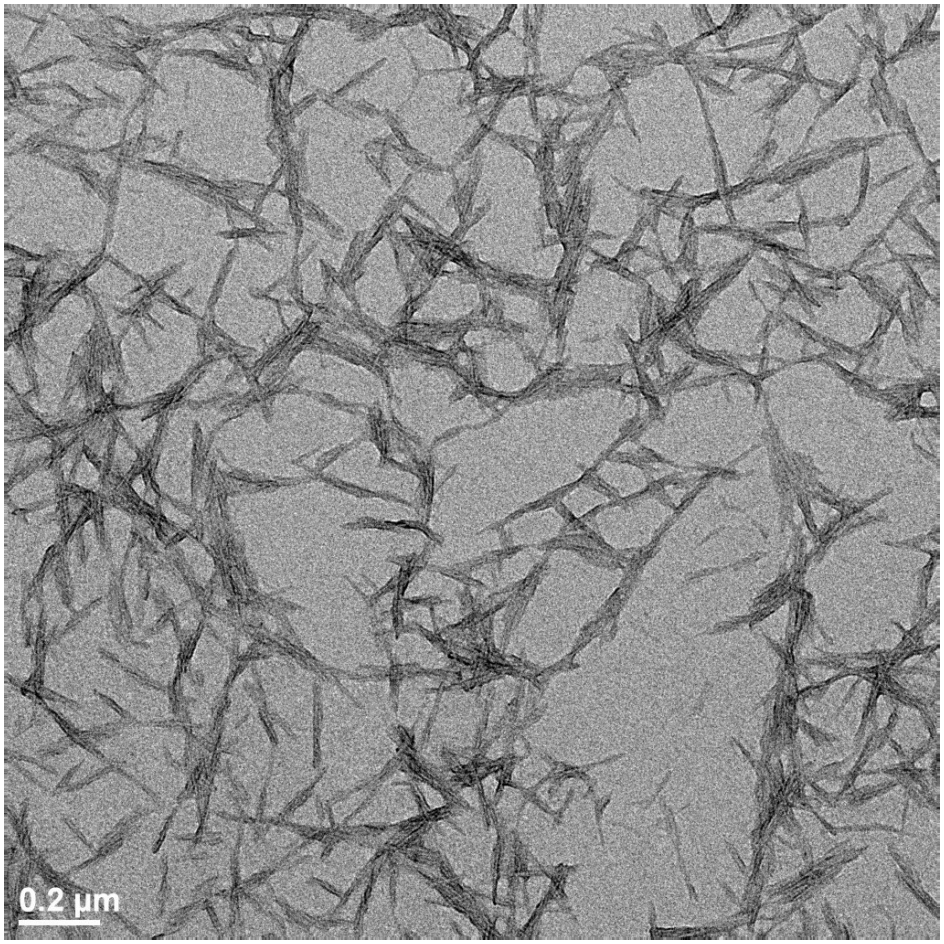
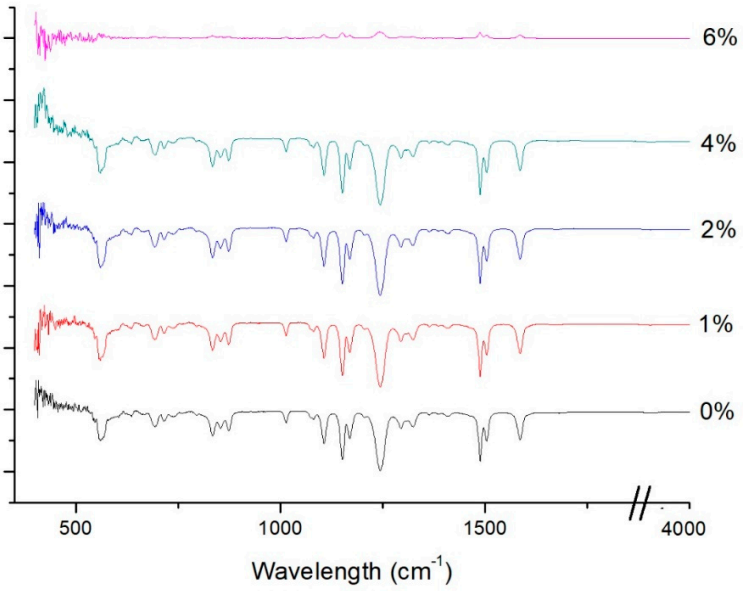



**Figure S1.** TEM image for CNCs captured by FEI Tecnai 12 BioTwin microscope which was operated at 120 kV. (Blue Goose Biorefineries Inc.).

(a)




(b)

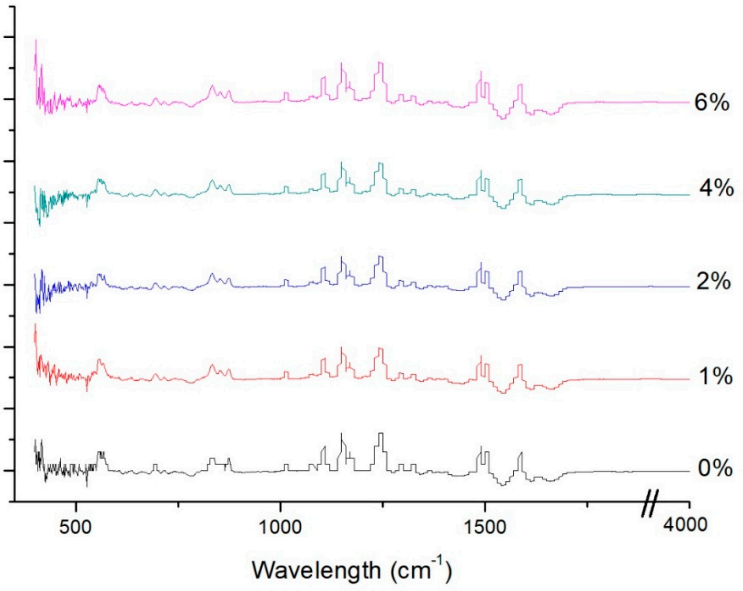



**Figure S2.** ATR FTIR of (a) SL, (b) TFC membrane with different loading ratios of CNCs in the support layer.