

Supplementary Information

Clustered sea crystals like structure of MnO₂@Cellulose and polypyrrole-decorated MnO₂@Cellulose nanostructured composite materials for the detection of Chemical Warfare Agent simulant

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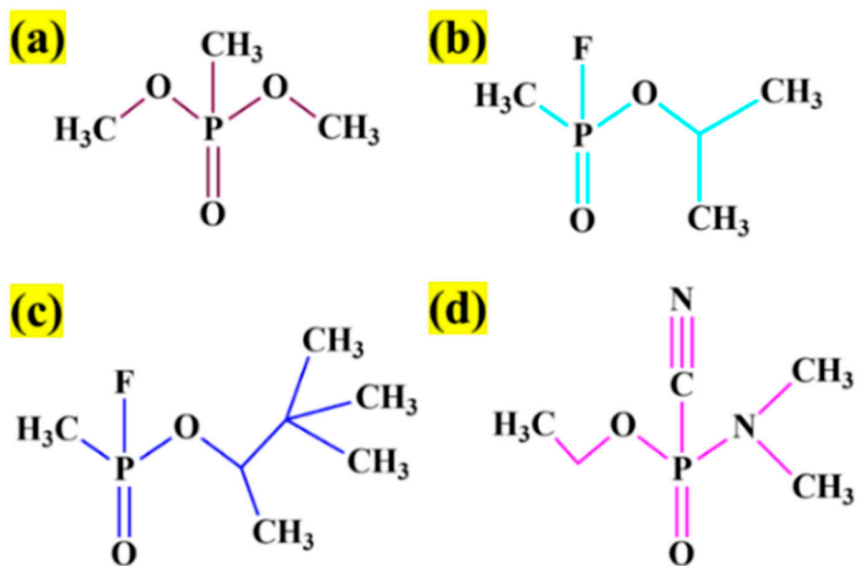


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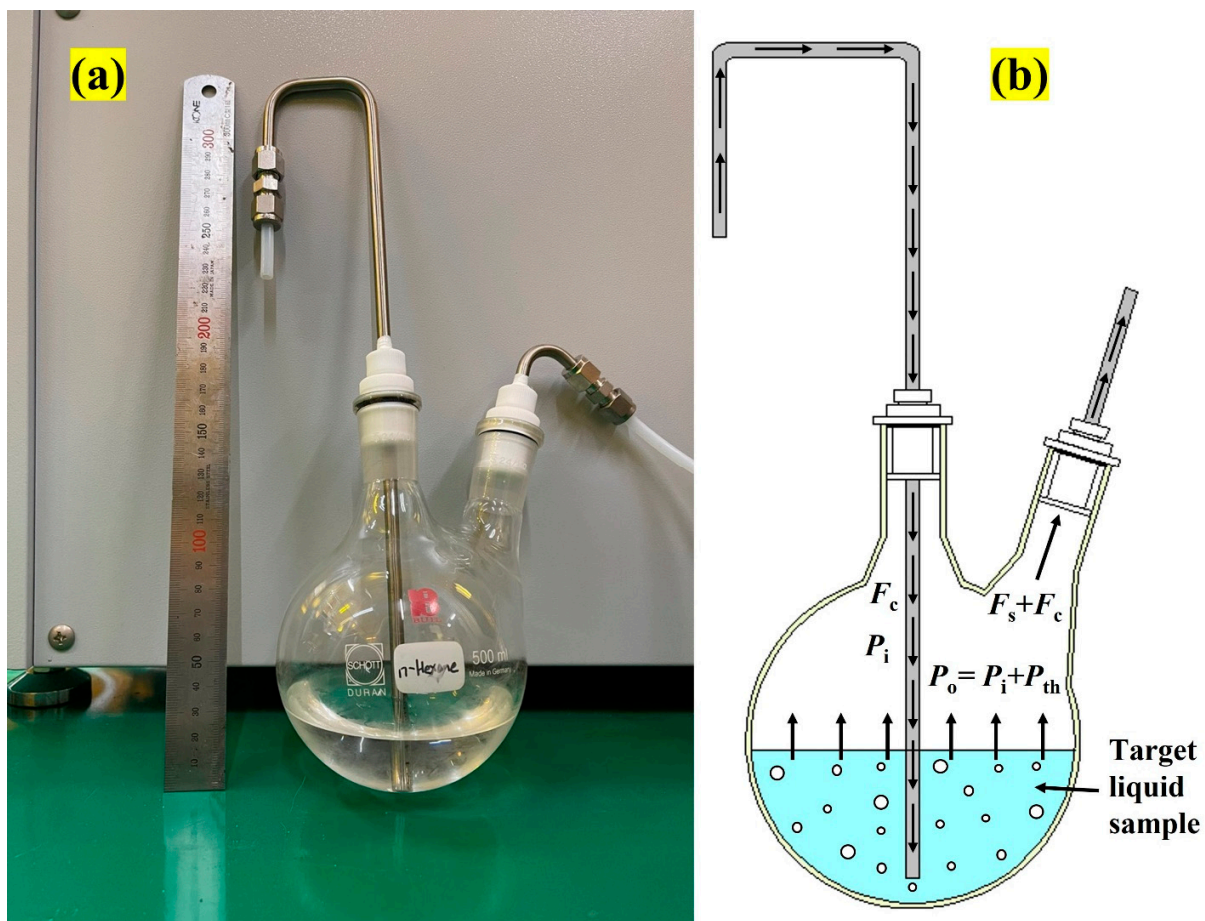


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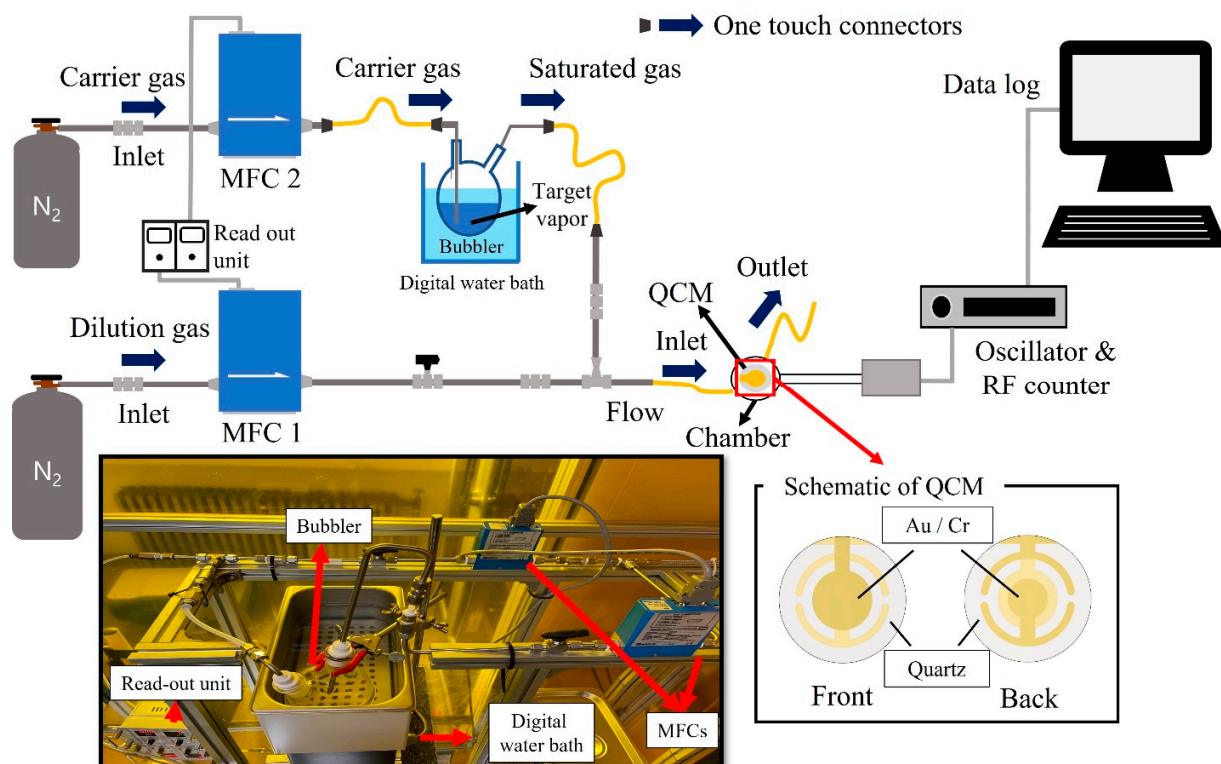


Figure S3. Schematic diagram of a gas sensing system for the QCM sensor.

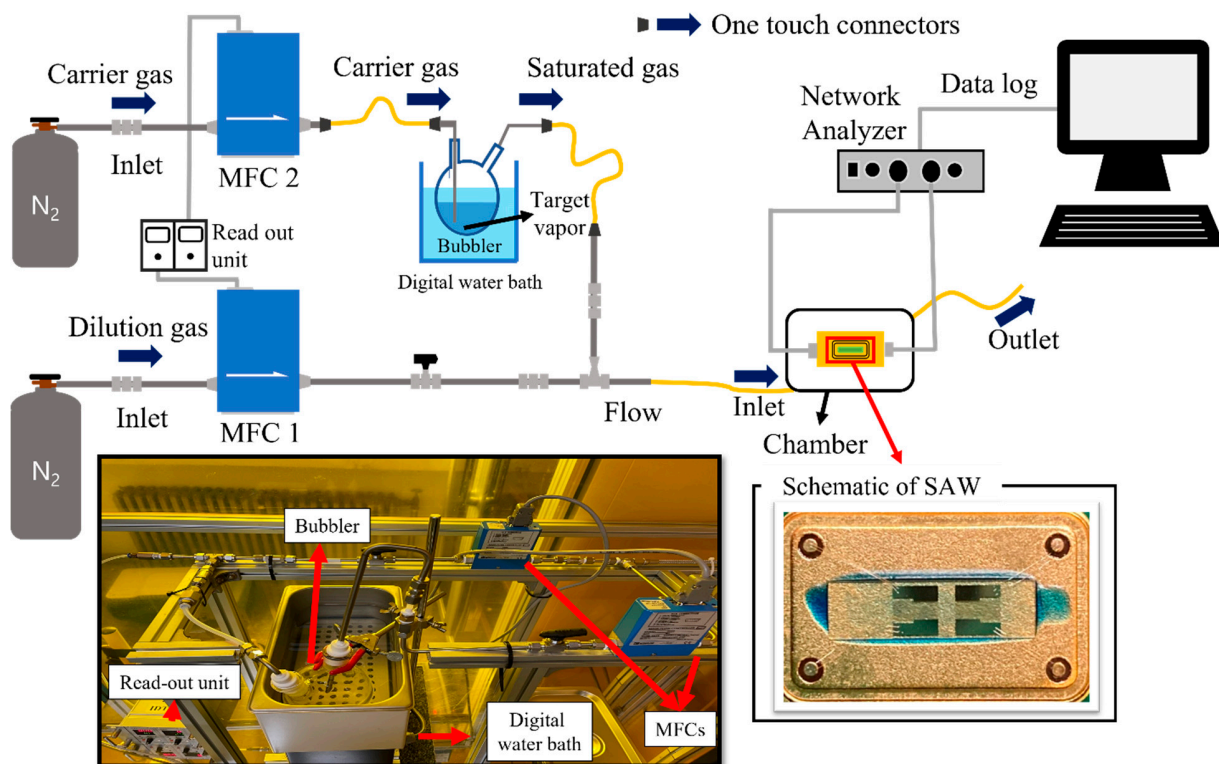


Figure S4. Schematic diagram of a gas sensing system for the SAW sensor.

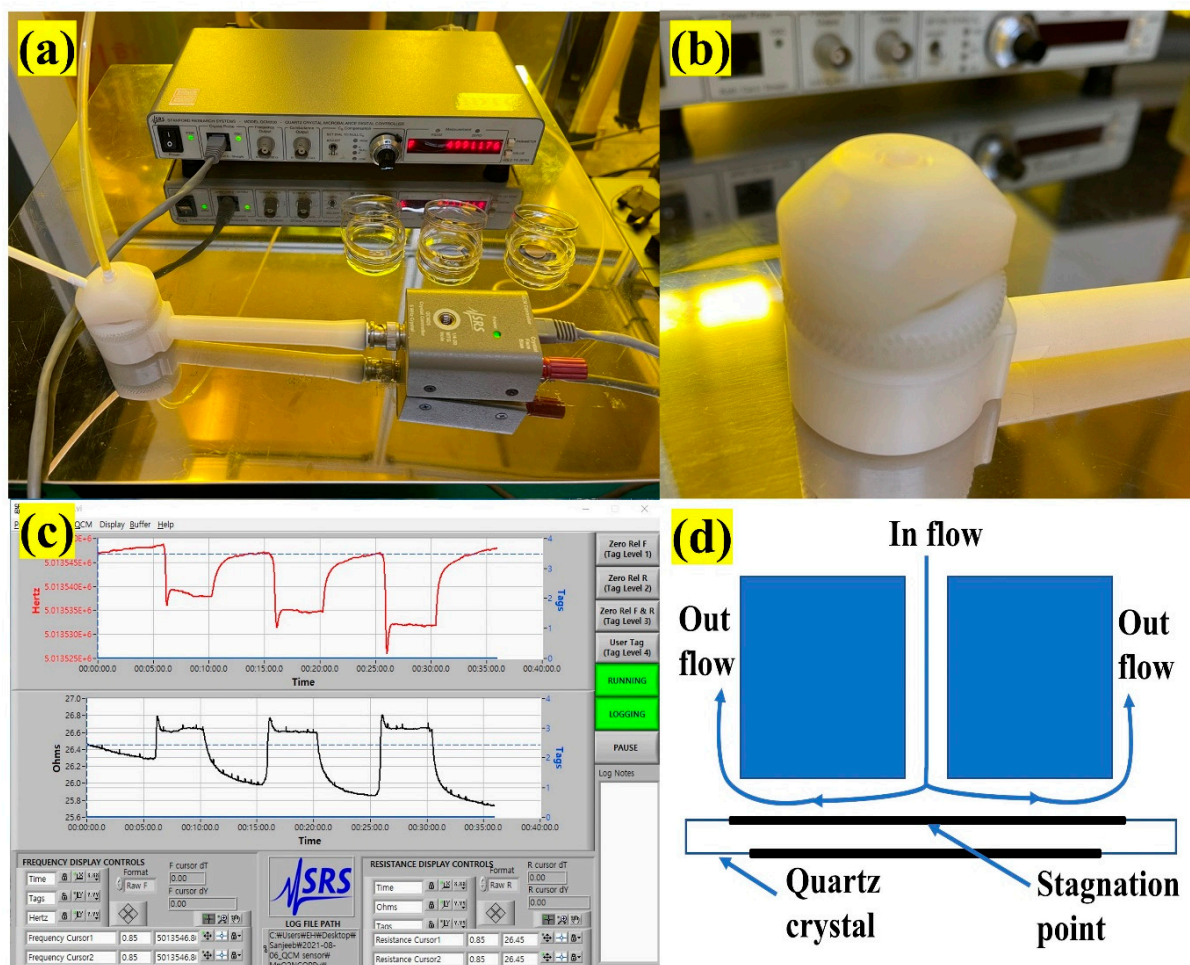


Figure S5. (a) QCM200 setup (digital controller, QCM crystals in Petri dish, crystal controller, and flow cell) (b) QCM flow cell (c) QCM signal monitoring program (d) Schematic diagram of gas flow pattern in the flow cell.

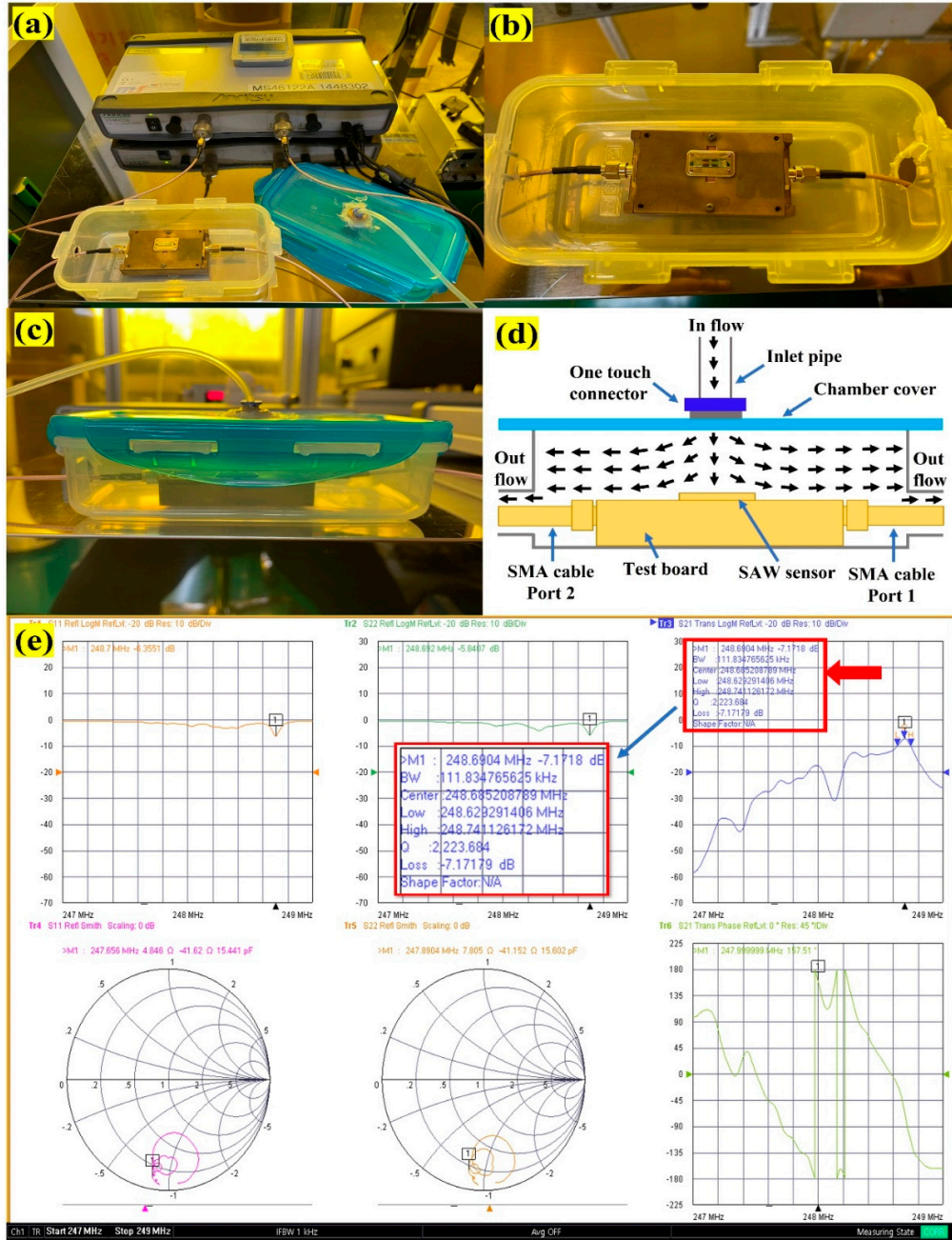


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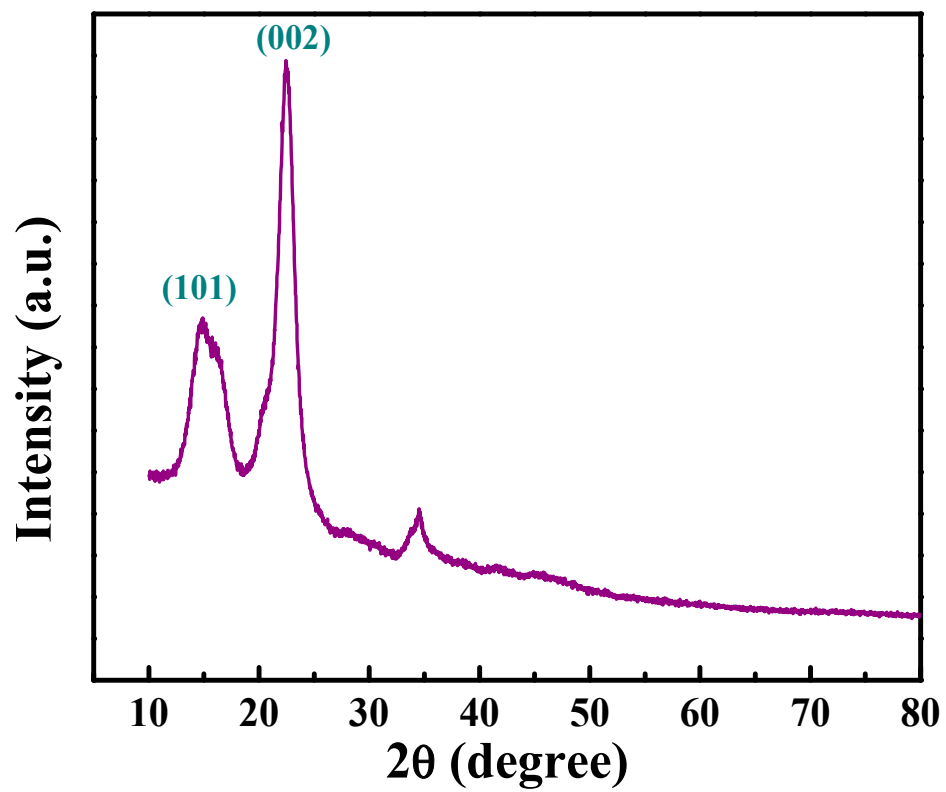


Figure S7. XRD analysis of cellulose.

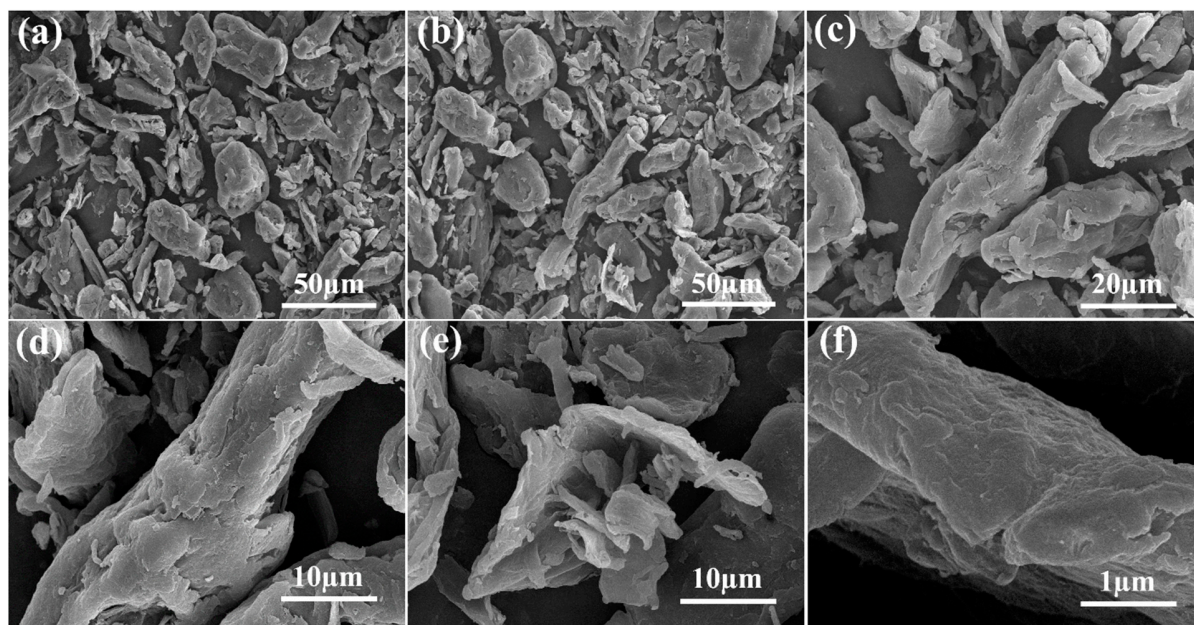


Figure S8. FE-SEM images of cellulose at the magnification of (a) 50 μm , (b) 50 μm , (c) 20 μm , (d) 10 μm , (e) 10 μm , and (f) 1 μm .

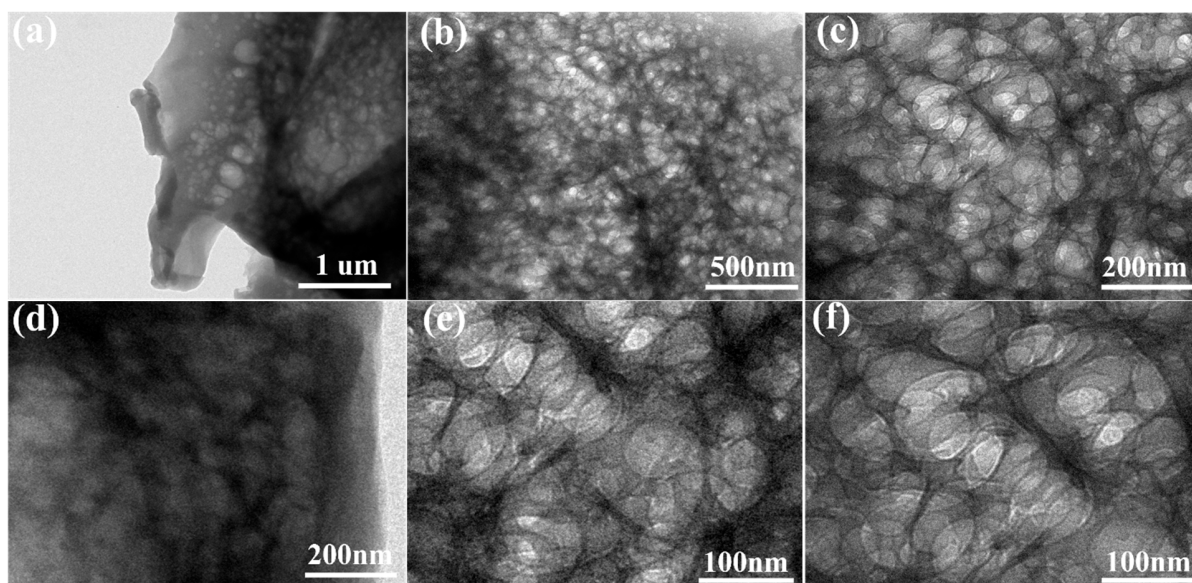


Figure S9. FE-TEM images of cellulose at the magnification of (a) 1 μm , (b) 500 nm, (c) 200 nm (d) 200 nm, (e) 100 nm, and (f) 100 nm.