Electronic Supplementary Information

Vapor/liquid polymerization of ultraporous transparent and capacitive polypyrrole nanonets

Luciano M. Santino[a], Yifan Diao[b], Haoru Yang[a], Yang Lu[b], Hongmin Wang[a], Erica Hwang[a], Julio M. D'Arcy[a,b,*]

[a] Department of Chemistry, Washington University in St. Louis, St. Louis, MO 63130
[b] Institute of Materials Science and Engineering, Washington University in St. Louis, St. Louis, MO 63130
E-mail: jdarcy@wustl.edu

Note: A video showing the polymerization of nanonets, subsequent processing and handling is available free of charge online.

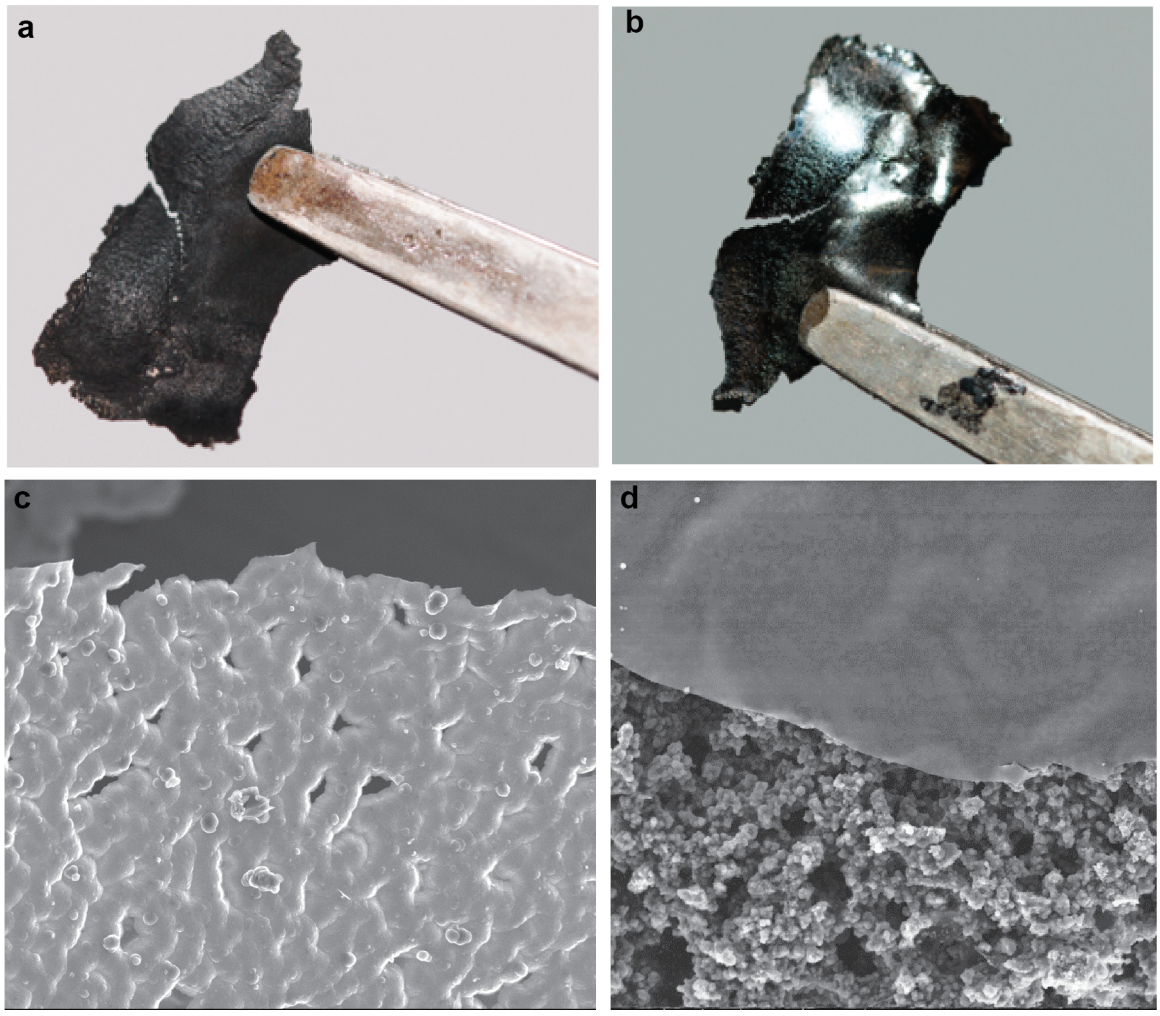

Figure S1: Allowing for full polymerization leads to a thick film with three distinct morphologies. (a) The vapor facing side of the film is matte. (b) The side facing the petri dish is shiny. (c) A thin film containing pinholes is visible at the vapor/liquid interface of (a). This film often detaches during processing. (d) A dense, smooth thin film forms at the substrate/oxidant interface. Granular particles are also visible at the bottom, where part of the thin film has torn.

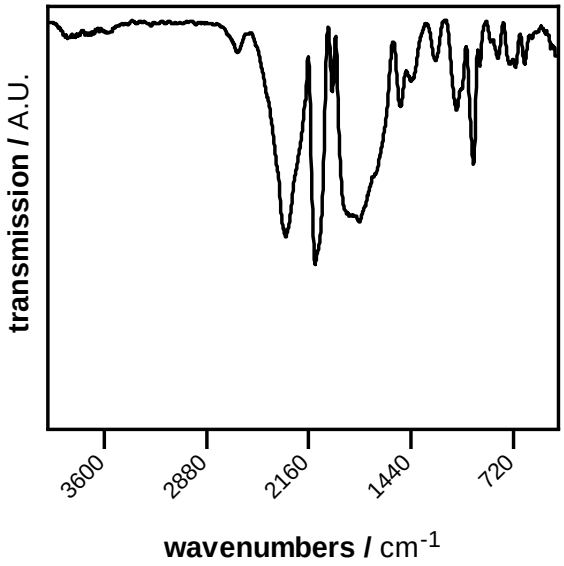

Figure S2: FTIR spectrum of a polypyrrole nanonet.

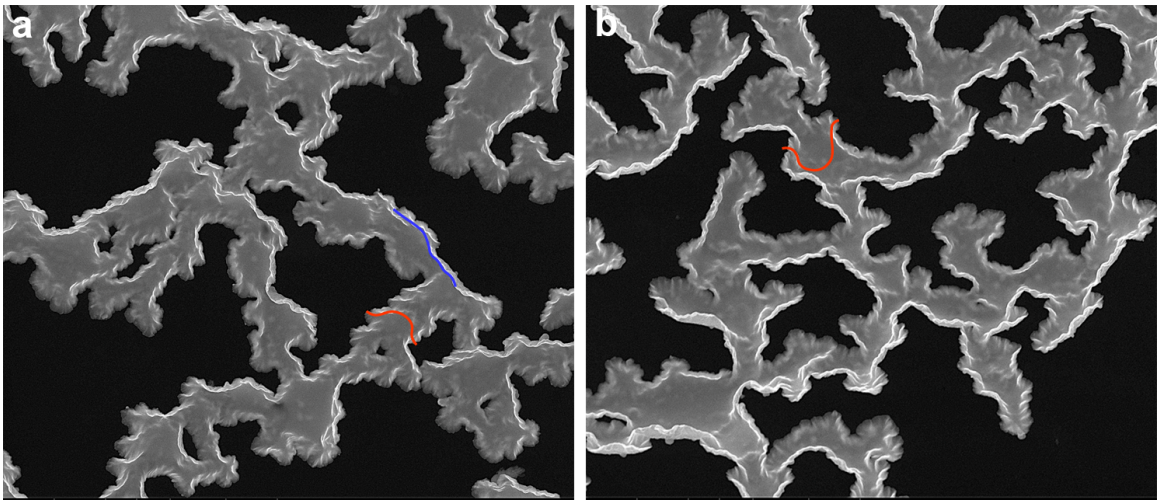

Figure S3: Scanning electron micrographs showing two sides of the same nanonet, convex (a) and concave (b).

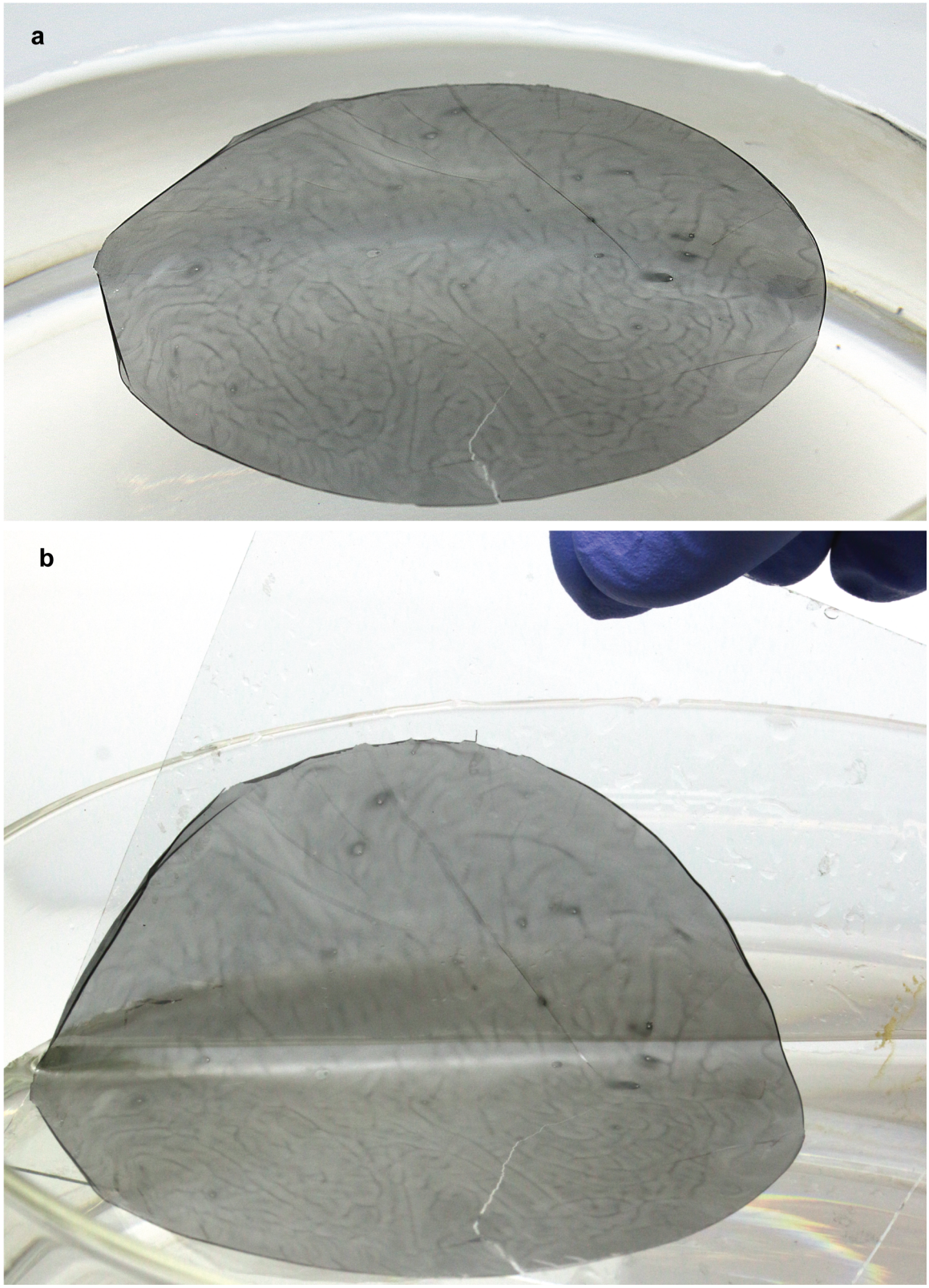

Figure S4: (a) A film after 90 minutes of polymerization is detached from its petri dish and floated at the air/water interface. (b) The film is picked up with a supporting glass substrate.

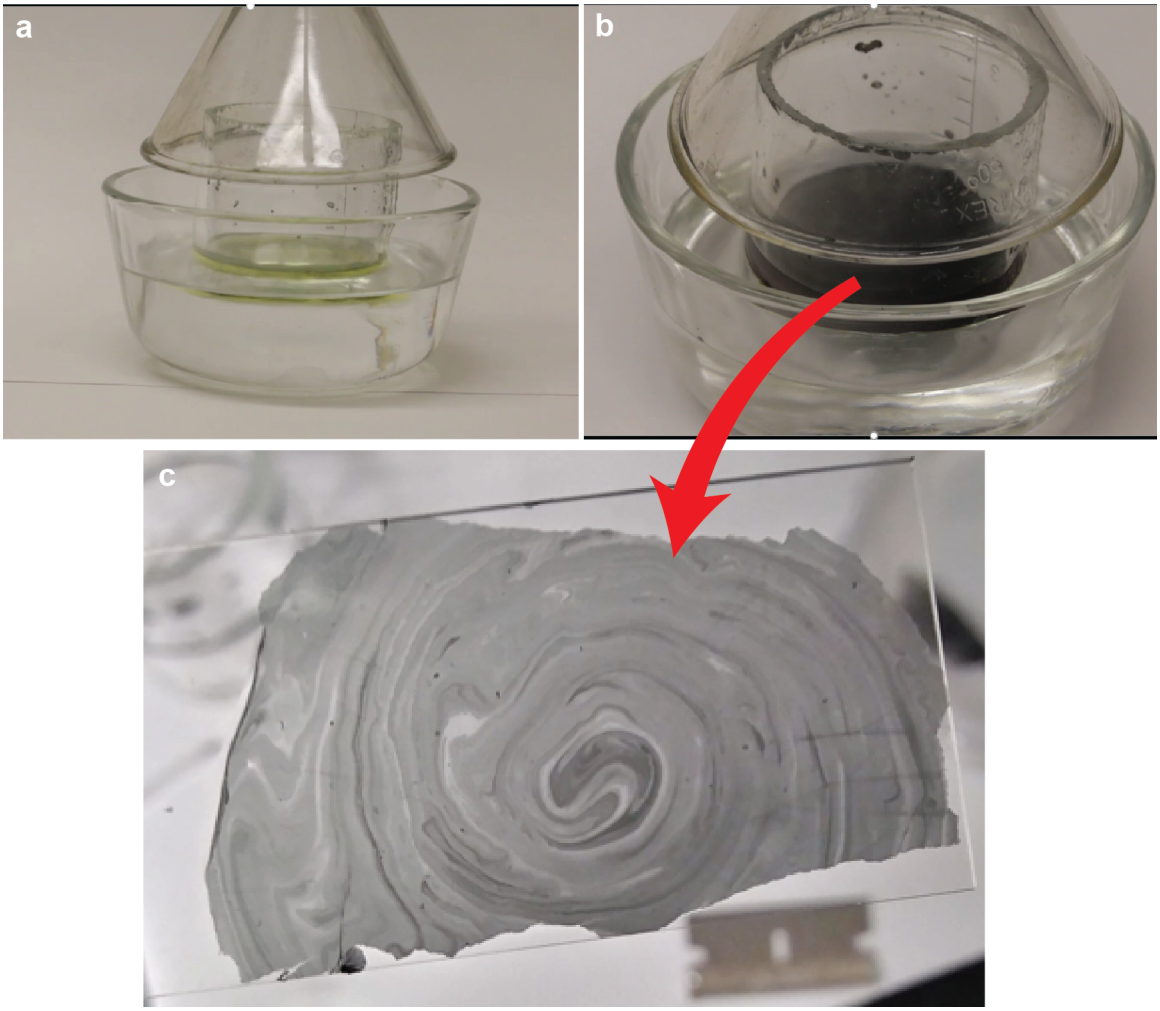

Figure S5: (a) Aqueous oxidant is floated on a dense immiscible organic solvent, constrained by a vertically oriented 3 cm diameter glass cylinder. Pyrrole vapor is flowed at its surface. (b) After 90 minutes of polymerization, the oxidant appears black. (c) The resulting film collected from the air-liquid interface shows a distinct spiral pattern.

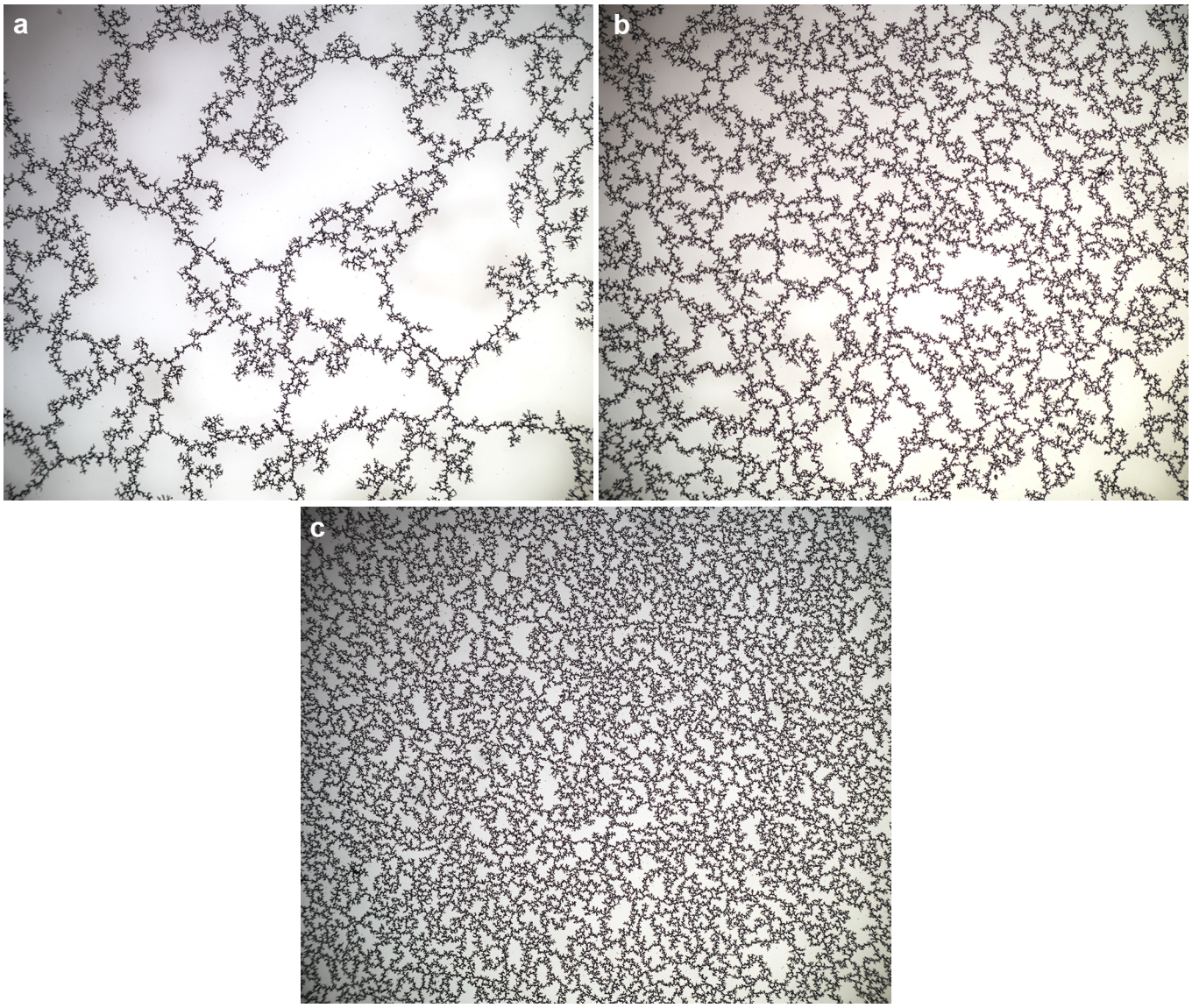

Figure S6: Optical micrographs at 10× showing web density as a variable of concentration of fluorinated surfactant in oxidant. (a) 130 ppm, (b) 260 ppm, (c) 400 ppm.

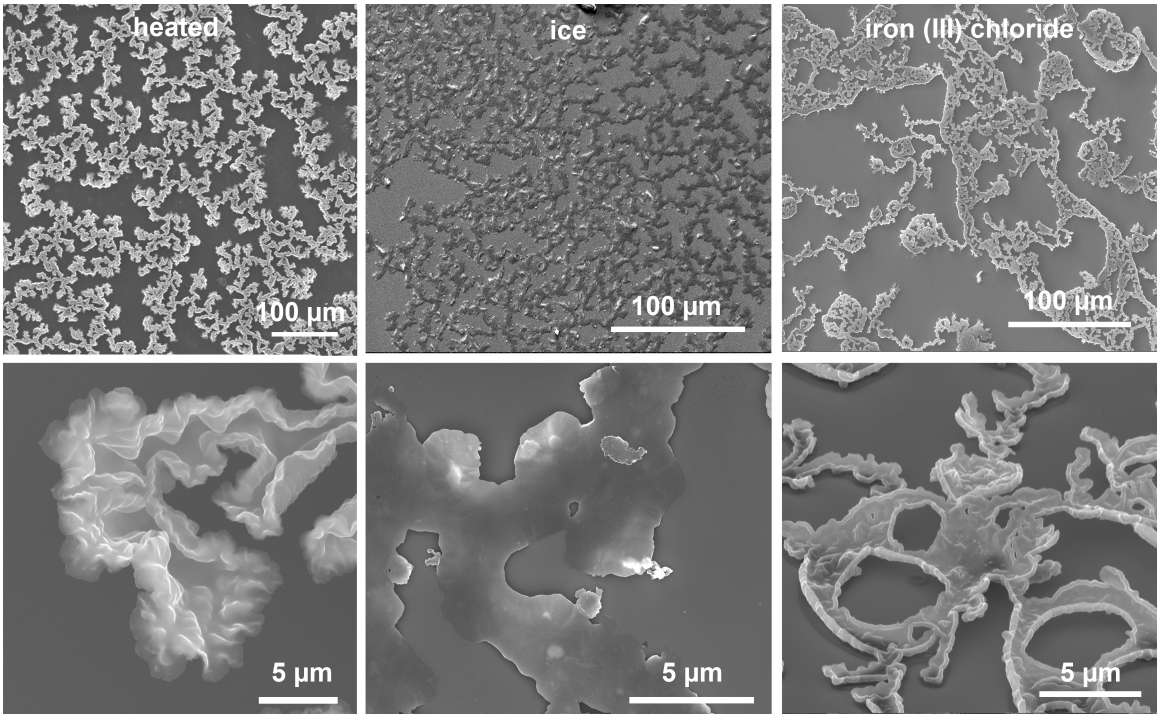

Figure S7: Nanonet morphology for a reaction heated to 35 °C, a reaction cooled in an ice bath, and a reaction using iron(III) chloride. All reactions 3 hours long.

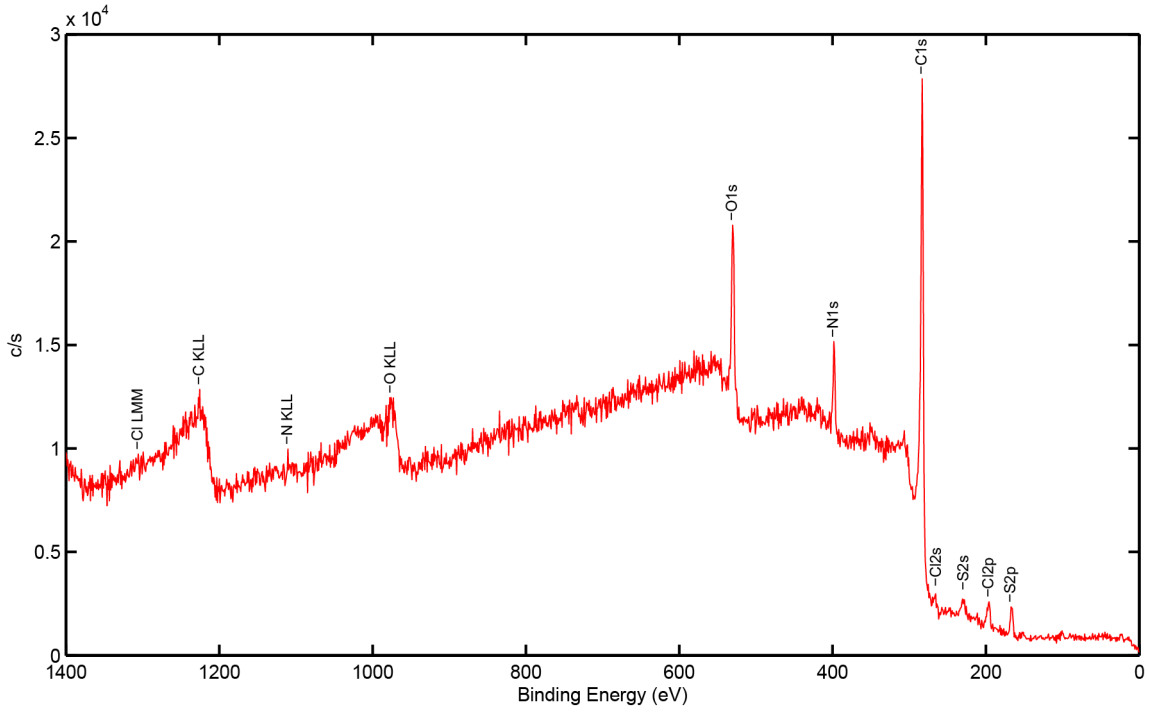

Figure S8: XPS survey spectrum of purified polypyrrole nanonet.