Supplementary Material (ESI) for Polymer Chemistry

Electronic Supplementary Information

Fabrication of Functional Polypyrrole (PolyPyr)-Nanotubes Using Anodized Aluminium Oxide (AAO) Template Membranes. Compromising between Effectiveness and Mildness of Template Dissolution Conditions for a Safe Release of PolyPyr-Nanostructures

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1. Fabrication of polyCOOH polyPyr-nanotubes using nanoporous AAO membranes as hard templates (SEM/TEM analyses)

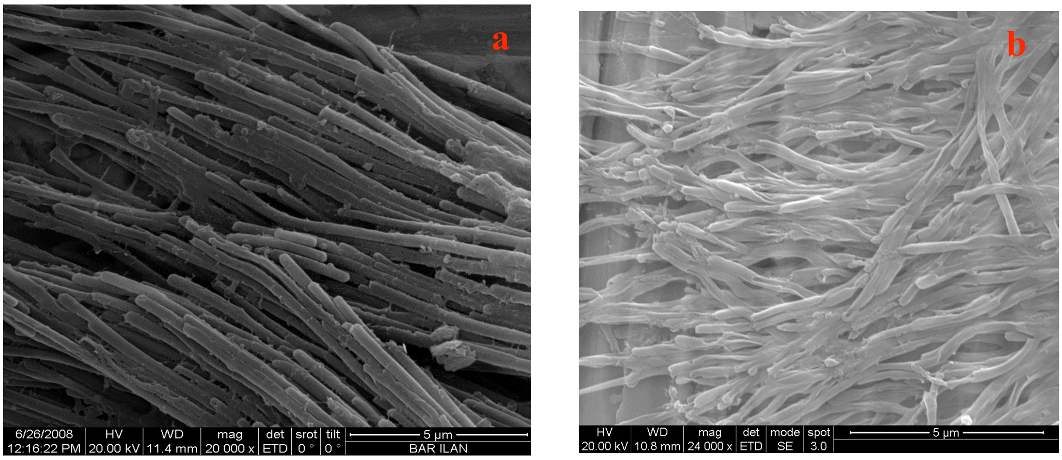


Figure ESI-1. SEM microphotographs of poly(**2**) nanotubes obtained by *acidic* digestion of AAO membranes: (**a**) & (**b**) 100 & 200 nm-sized pores respectively

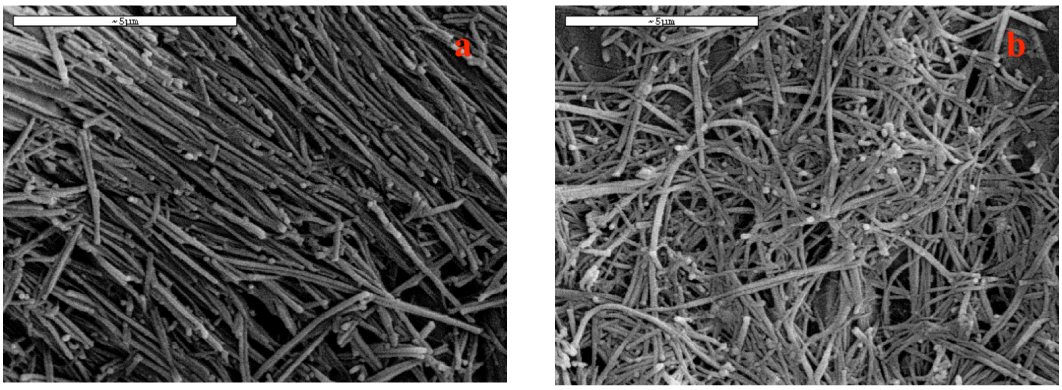


Figure ESI-2. SEM microphotographs of poly(**3**) nanotubes obtained by *acidic* digestion of AAO membranes: (**a**) & (**b**) 100 & 200 nm-sized pores respectively

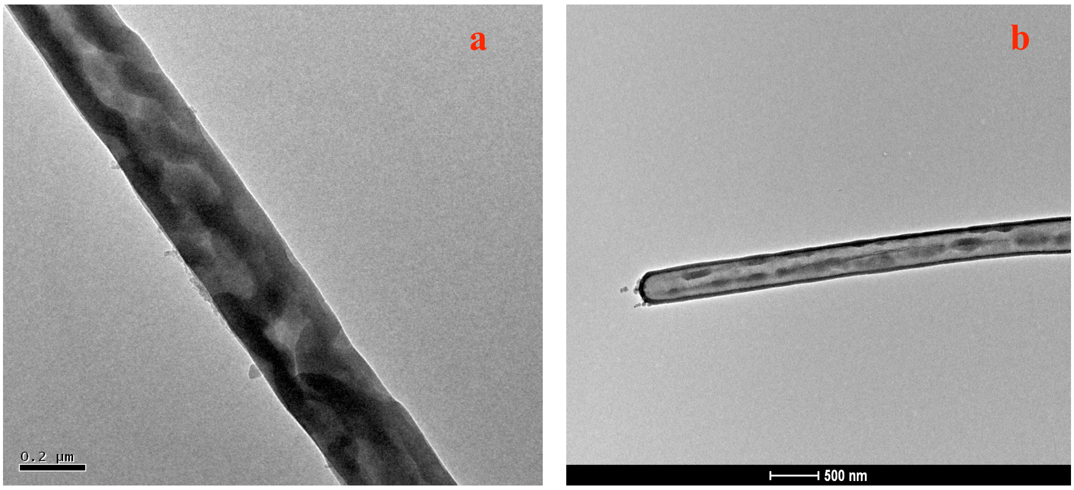
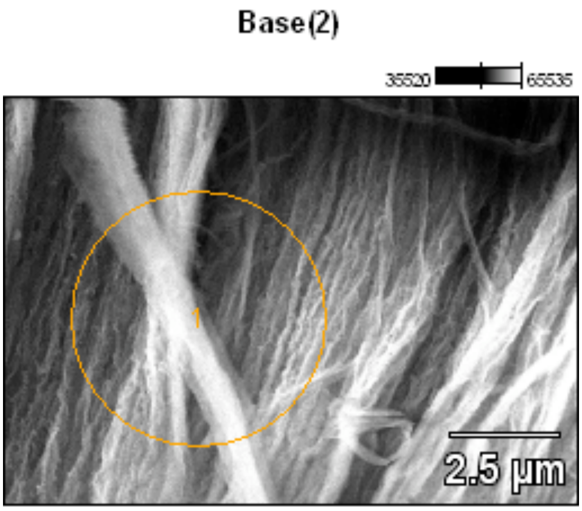


Figure ESI-3. TEM microphotographs of poly(**2**) and poly(**3**) nanotubes obtained by *acidic* digestion of AAO membranes (200 nm-sized pore diameter, **a** & **b** respectively)



	C	*N*	*O*	*Al*	*Cl*	*Cu*	*Zn*
Base(2)_pt1	70.66	18.45	9.88	0.19	0.31	0.13	0.39

Figure ESI-4. HR-SEM microphotograph of poly(**DPL 1**) nanotubes (100 nm-sized pores of AAO membrane, *acidic* template dissolution) with atomic compositional EDS analysis showing the absence of the Fe element due to *acidic* digestion conditions

2. Morphological features of poly(2-3) nano<u>tubes</u> (*acidic* digestion conditions of AAO templating membranes, 50 counted objects for averaged measurements using an *Image J software*)

Nano<u>tube</u>	**Pore size (nm)**	**Length (µm)**	**Diameter (nm)**	**Aspect ratio**	**Wall thickness (nm)**
Poly(**2**)	100	11.8	270.7	43.4	26.8
"	200	15.8	335.1	47.2	68.5
Poly(**3**)	100	11.7	272.3	42.9	29.5
"	200	7.8	252.3	30.8	34.6

Table data relate to poly(**2-3**) nanotubes obtained using *the same LPP protocol* (p. 2 of the manuscript). Both diameter and wall thickness differences for poly(**2**)/poly(**3**)-nanotubes obtained for <u>100 nm</u>-sized AAO templates are minimal, i.e. 270.7 *versus* 272.3 nm and 26.8 *versus* 29.5 nm respectively. This is no longer the case for <u>200 nm</u>-sized AAO templates. Significant diameter and wall thickness differences are observed, i.e. 335.1 *versus* 252.3 and 68.5 versus 34.6 nm. This intriguing phenomenon may arise from a better dynamic availability of *less sterically demanding* monomer **2** *versus* monomer **3** during *intra-pore* LPP oxidations/polymerizations. Nevertheless and for both types of templates, aspect ratio values are around twice higher than the ones observed for same nanostructures released during *basic* AAO template digestions.

3. Illustrative FT-IR spectroscopy of polyPyr-nanotubes

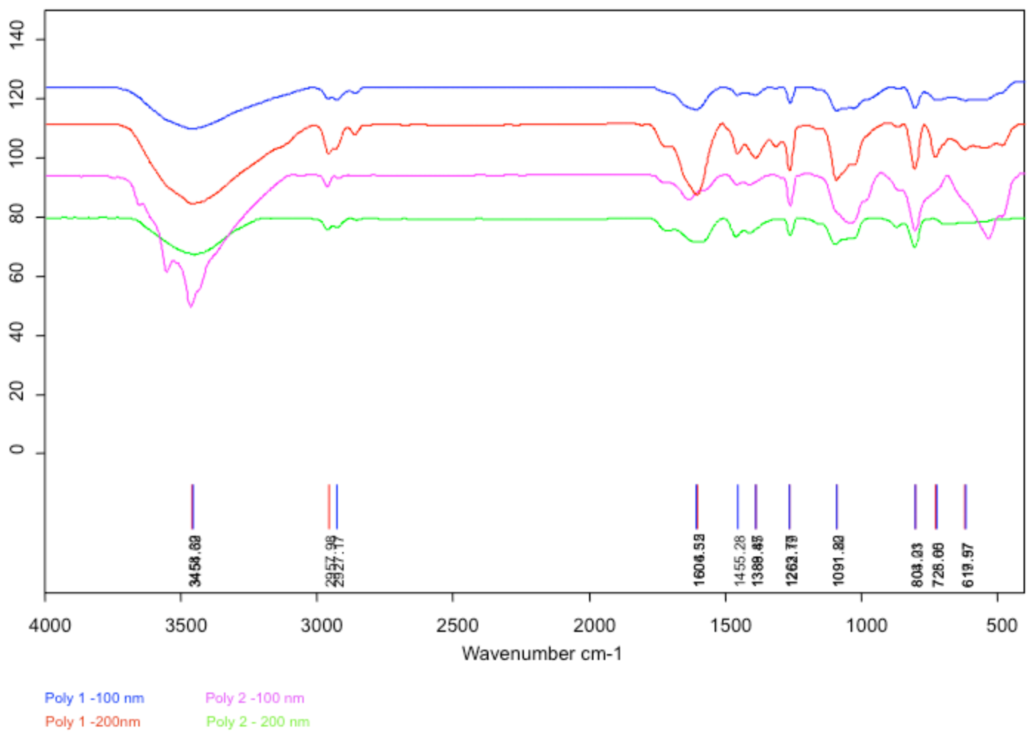


Figure ESI-5. FT-IR spectra of polyCOOH poly(**1-2**) polyPyr-nanotubes (*acidic* digestion for both 100 & 200 nm-sized pores of AAO templating membranes)