Supporting Information

Development of WO_3-Nafion based membranes for enabling higher water retention at low humidity and enhancing PEMFC performance at intermediate temperature operation.

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Contact angle results

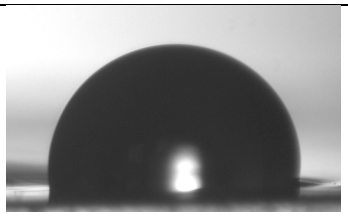
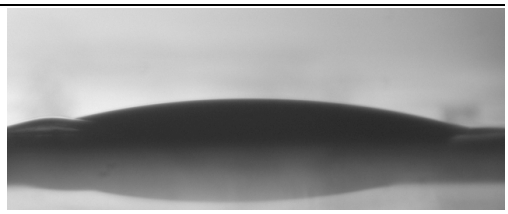
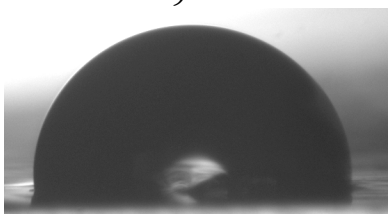
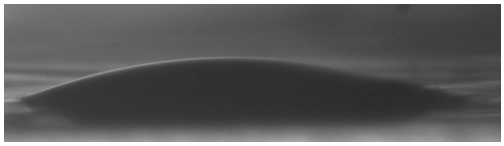
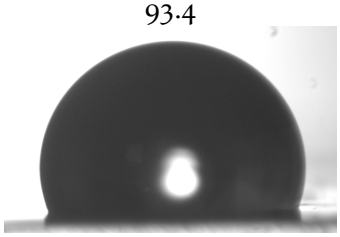
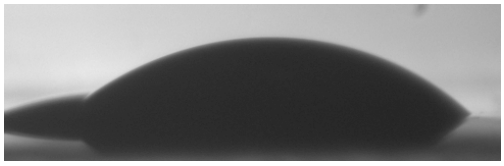
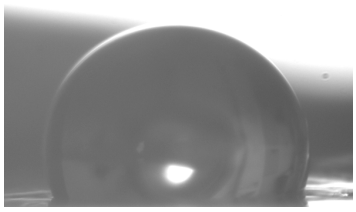
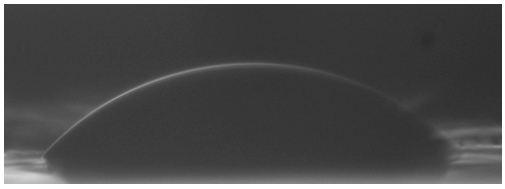
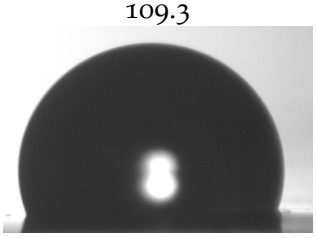
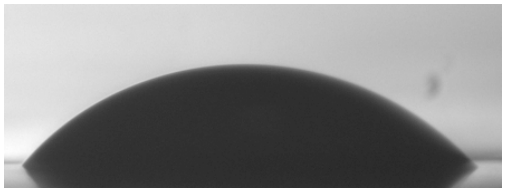
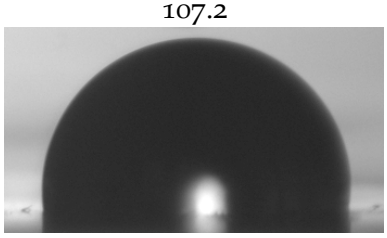
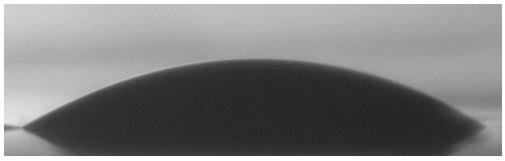
sample type	θ_a / °	θ_r / °
XL		
	98.0	15.5
rNF		
	93.4	19.7
rNF + 5% WO_3		
	106.7	44.7
rNF + 7.5% WO_3		
	109.3	46.8
rNF + 10% WO_3		
	107.2	48.2
rNF + 15% WO_3		
	97.6	33.0

Figure S1. Representative advancing (θ_a) and receding (θ_r) water contact angles of the membranes.

WO_3 is known to be hydrophilic, with reported (static) water contact angles ranging from 4 to 104°, typically around ~30° (Table S1).

Table S1. Reported (static) water contact angles of different WO_3 layers

type	water CA / °	remark	ref
sol–gel dip-coated	13–55	in function of the annealing temp.	Azimirad 2007; Naseri 2007
sol–gel dip-coated	97–104	5-15 multilayer	Raudoniene, 2018
thermally evaporated film	4–57	in function of the annealing temp.	Azimirad 2007
sol–gel spin-coated	26–30	further decreasing by long UV irradiation	Miyauchi M 2009
spray pyrolisis	28	nanoporous layer	Vlauduta C, 2008; Enesca, 2008
spray pyrolisis	58	dense layer	Vlauduta C, 2008; Enesca, 2008
pulsed spray pyrolysis	30		Enesca, 2008
sol–gel spin-coated	21–92	in function of the annealing temp.	Hemati, 2013
sol–gel	44	after being annealed at 450 °C for 1 h	Liu, 2018
spray pyrolisis	31		Vardhan, 2022
pulsed laser deposition	27–56	depending on the process temperature	Behbahani, 2013
spray pyrolisis	6–7		Vardhan, 2020
sol–gel spin-coated	16–36	on the top of VO_2 substrate layers; depending on process parameters	Top, 2018
reactive magnetron sputtering	5–73	depending on process temperature	Ramana, 2020

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