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Supplementary Information

A Surface Passivated Fluorinated Polymer Nanocomposite for Carbon Monoxide Resistant Plasmonic Hydrogen Sensing

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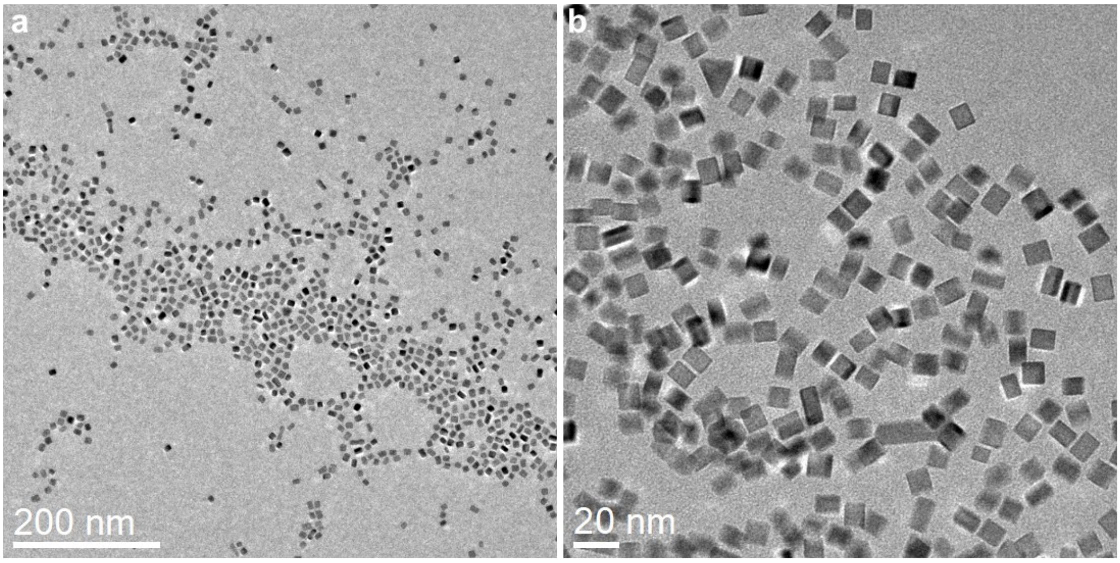

Fig. S1. TEM images of Pd nanocubes, recorded after flow synthesis.

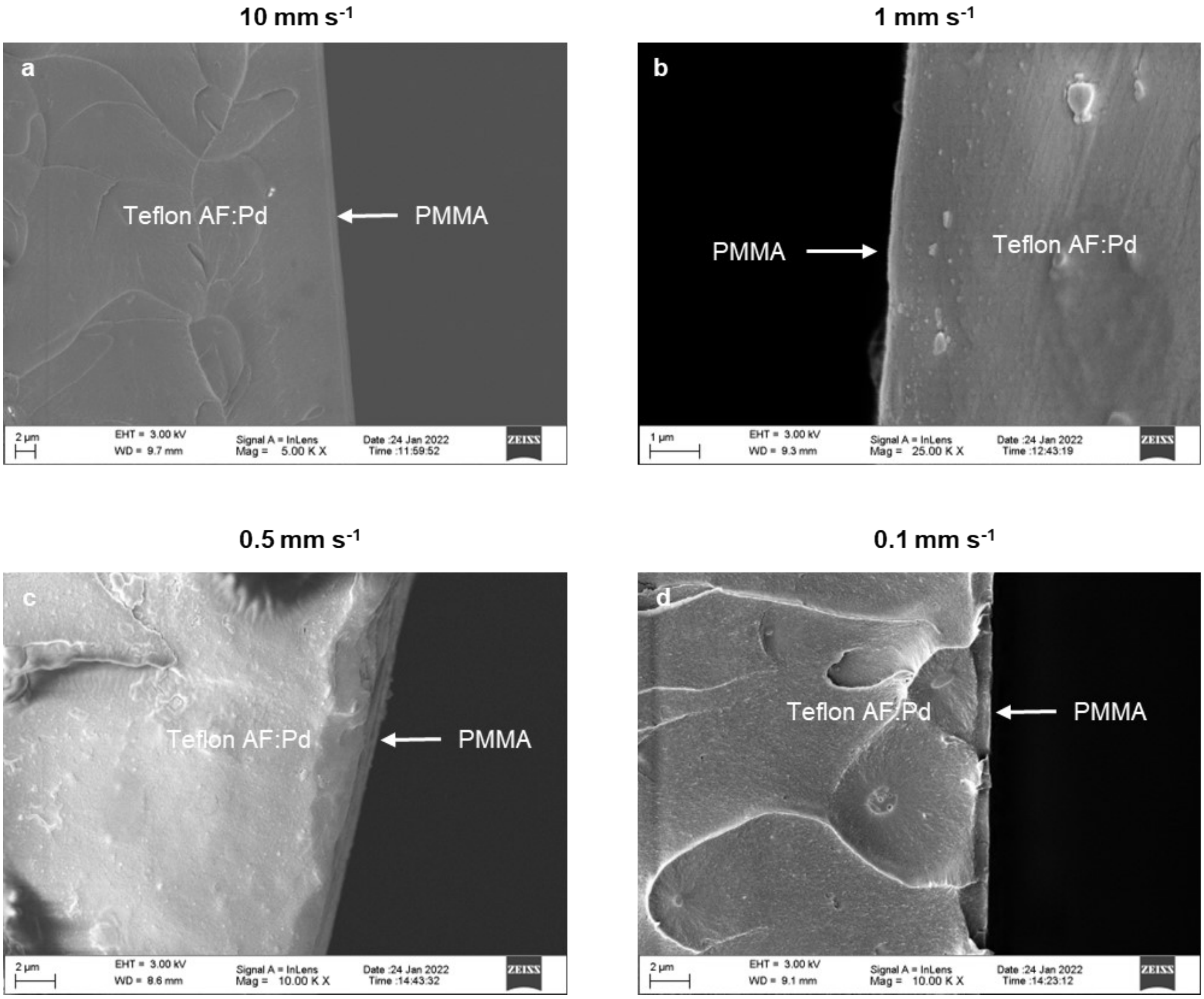

Fig. S2. SEM images of cross-sections of Teflon AF:Pd films dip coated in PMMA at speeds of a) 10 mm s^{-1}, b) 1 mm s^{-1}, c) 0.5 mm s^{-1}, and d) 0.1 mm s^{-1}.

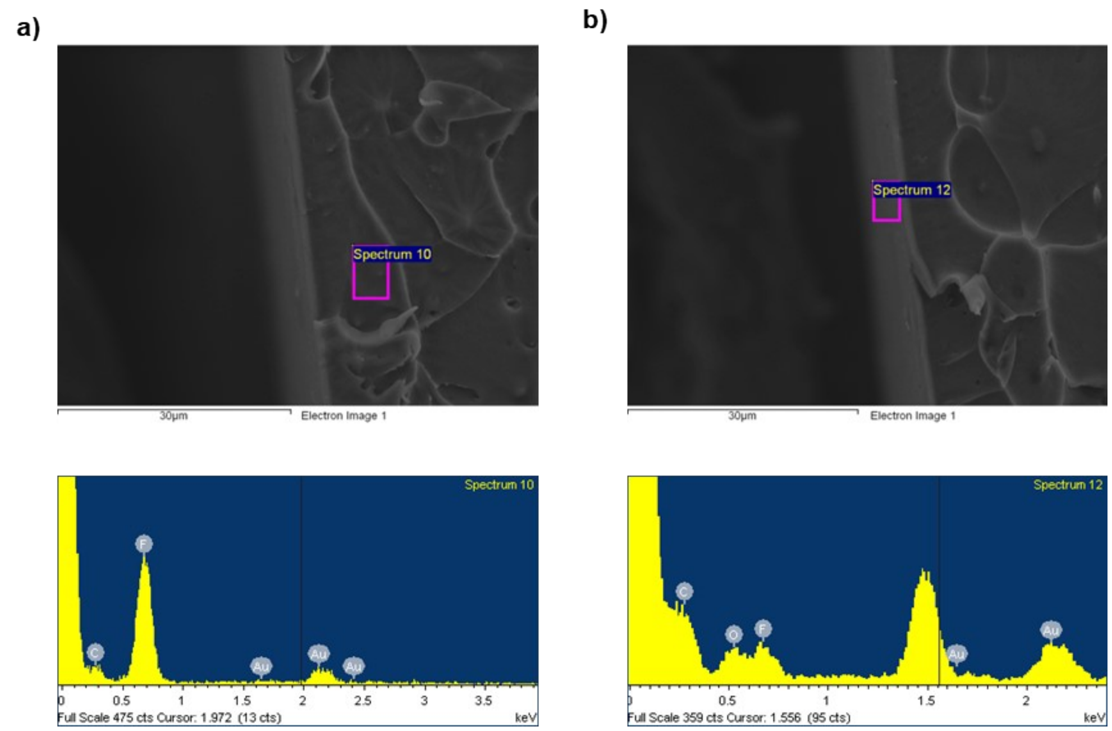

Fig. S3. SEM images (top) and corresponding EDX spectra (bottom) for identification of fluorine as an indication of Teflon AF, recorded a) far away from the sample surface, and b) close to the surface of the cross-section of a Teflon:Pd film dip coated at 5 mm s^{-1} in PMMA:anisole solution.

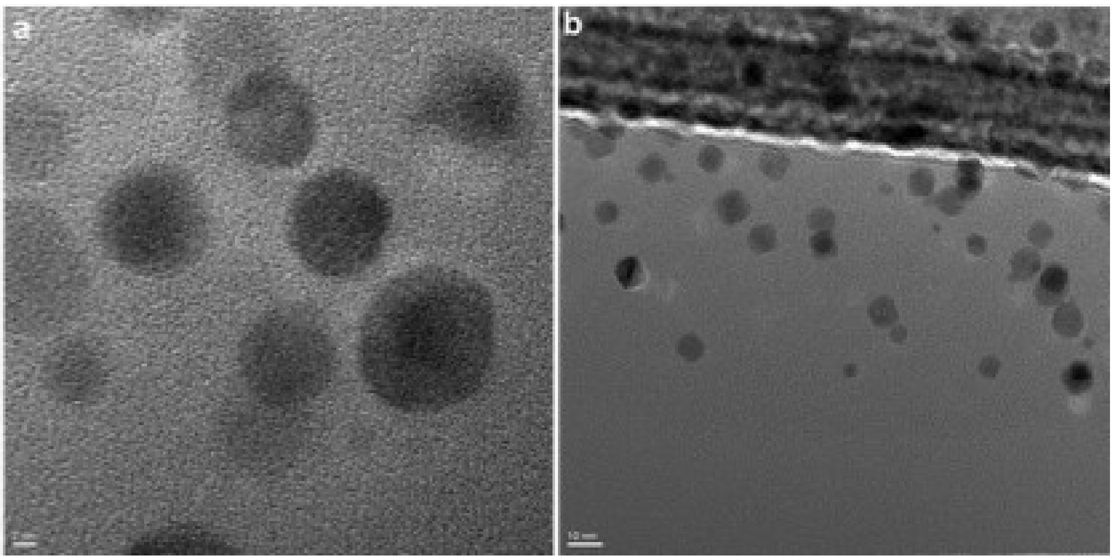

Fig. S4. TEM images of Pd nanoparticles in the Teflon AF:Pd nanocomposite.

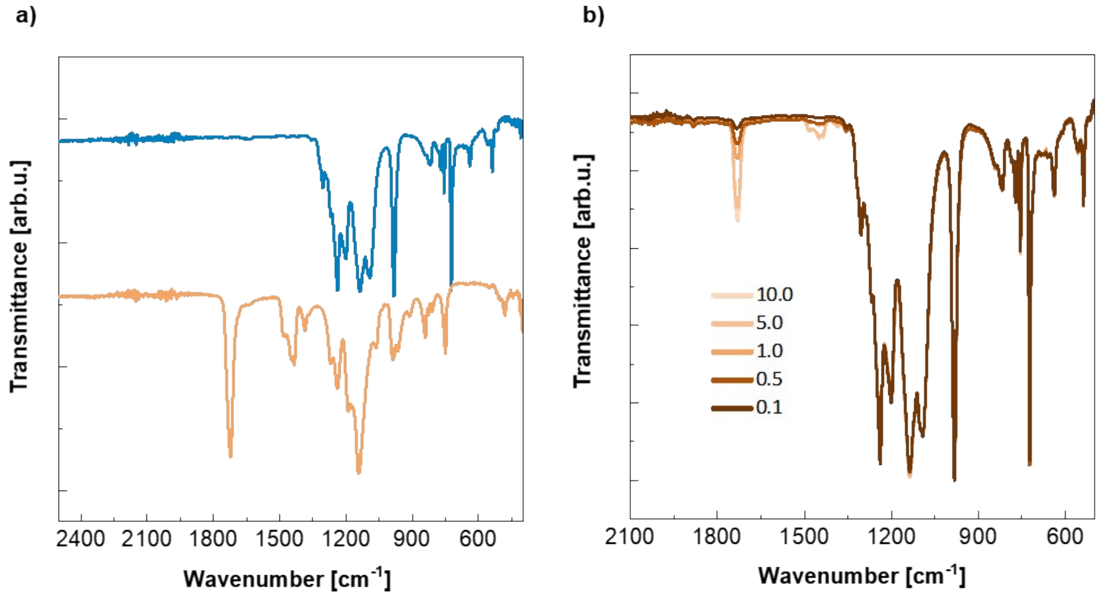

Fig. S5. FTIR-ATR spectra of the surface of a) Teflon AF and PMMA, and b) of Teflon AF:Pd films dip coated in PMMA:anisole solution at different dip coating speeds.

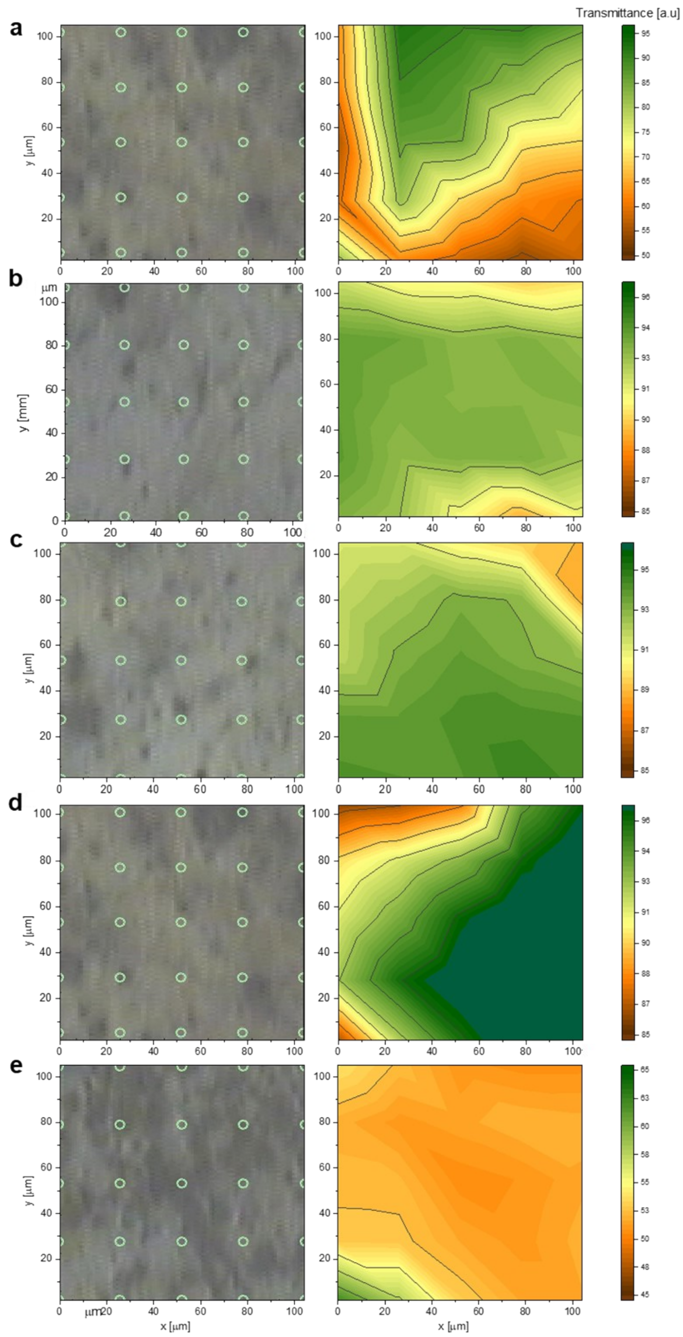

Fig. S6. FTIR mapping of the surface of Teflon AF:Pd films coated with a a) 90 nm, b) 160 nm, c) 250 nm, d) 570 nm and e) 720 nm thick PMMA layer. Optical micrographs of the mapped area left, and normalized transmittance signal at 1734 cm^{-1} (right). The regions with yellow-orange color represent a lower transmittance at 1734 cm^{-1}, which indicates that the thickness of the PMMA coating varies.

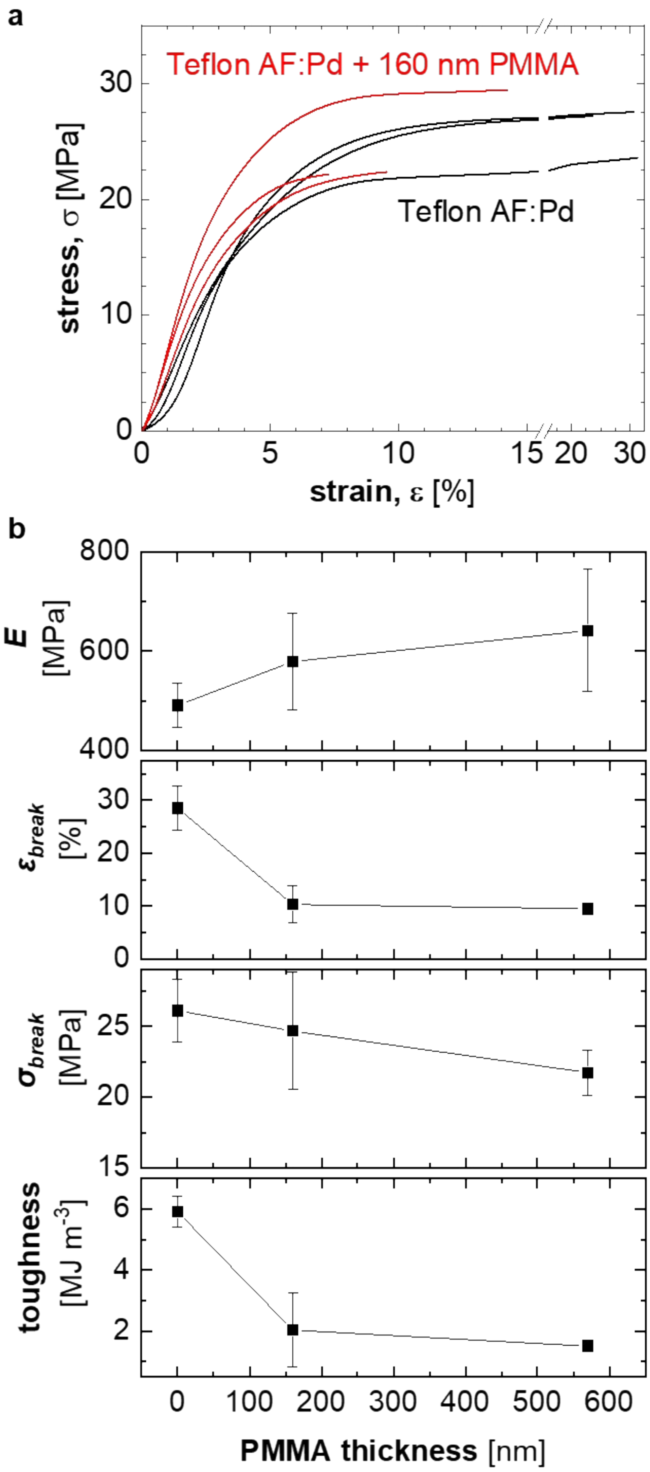

Fig. S7. a) Stress-strain curves recorded during tensile deformation of Teflon AF:Pd nanoparticle composite films without (black) and with a 160 nm thick PMMA coating (red); and b) Young's modulus E, strain at break ε_{break}, stress at break σ_{break} and toughness as a function of PMMA coating thickness; data points and error bars correspond to mean values and standard deviations of three measurements.

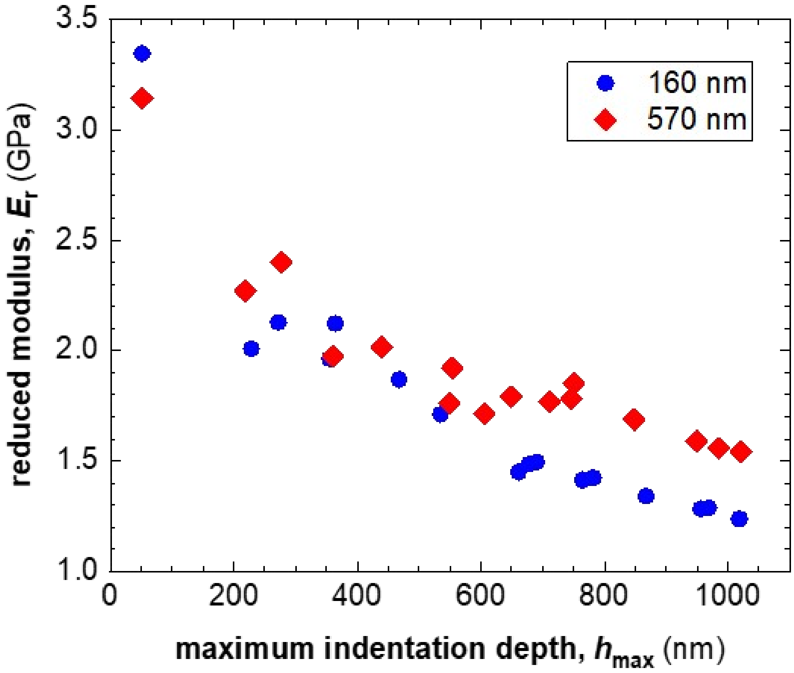

Fig. S8. Reduced modulus E_r as a function of maximum indentation depth h_{max} measured with nanoindentation of a Teflon AF:Pd nanoparticle composite film coated with 160 nm PMMA (blue) and 570 nm PMMA (red).

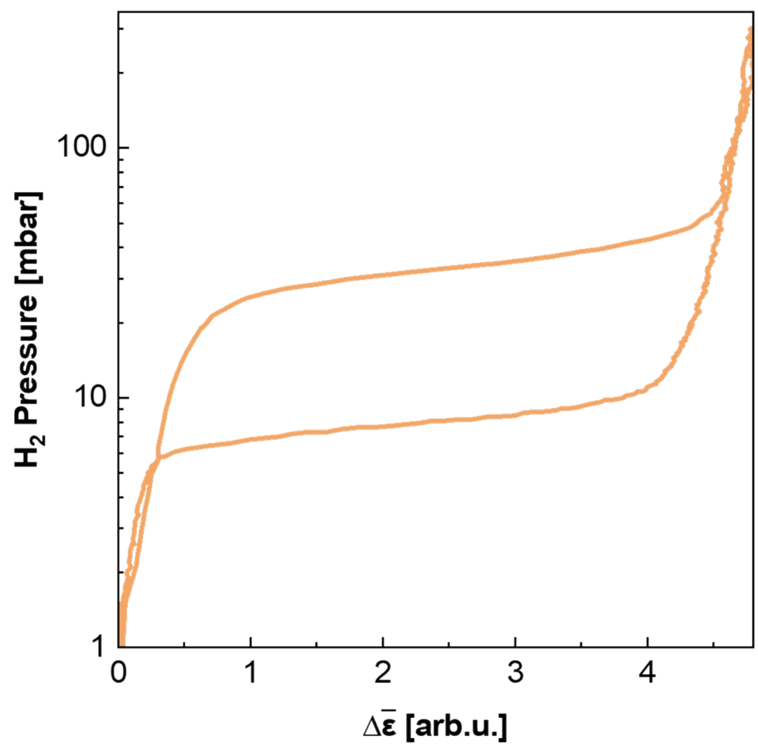

Fig. S9. Optical pressure-composition isotherm for a Teflon AF:Pd film with a 720 nm thick PMMA coating obtained at 30 °C.

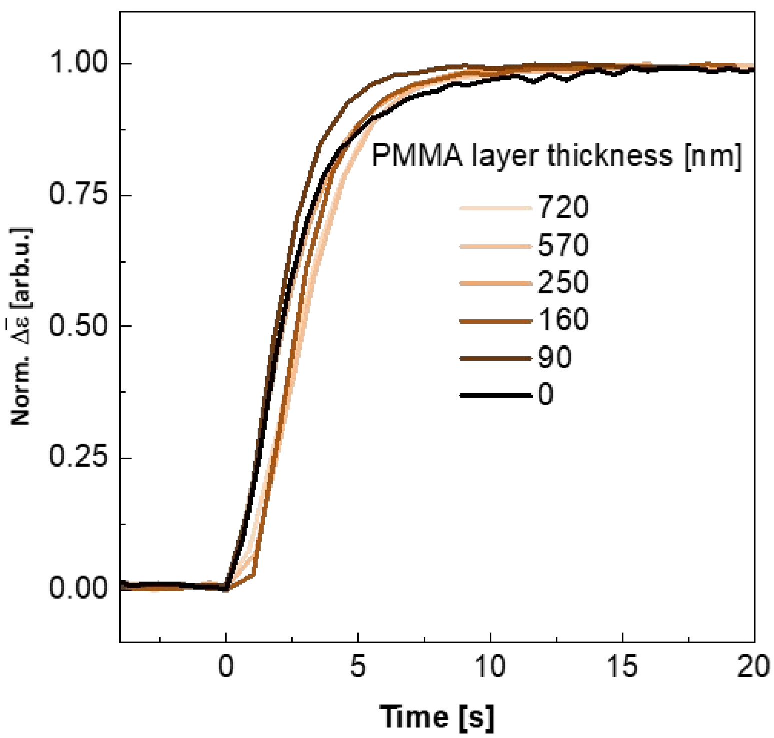

Fig. S10. Normalized $\Delta\bar{\varepsilon}$ recorded for a Teflon AF:Pd film dip coated with PMMA upon a step-wise increase in H_2 pressure from 0 to 100 mbar (the H_2 valve opens at t = 0).

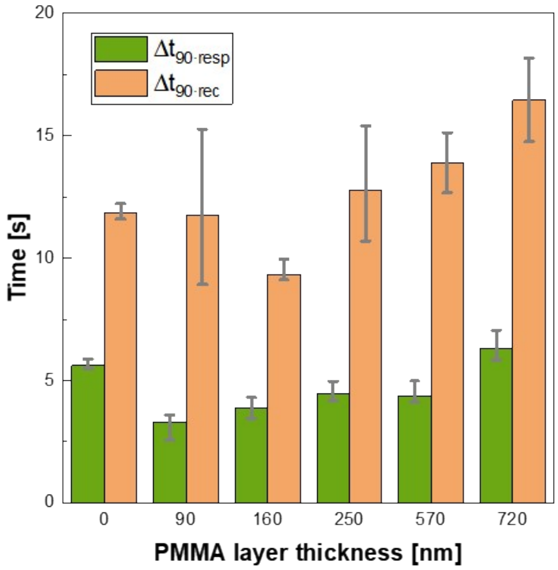

Fig. S11. Response time $\Delta t_{90 \cdot resp}$ and recovery time $\Delta t_{90 \cdot rec}$, defined as $\Delta t_{90 \cdot resp} = t_{90 \cdot resp} - t_{10 \cdot resp}$ and $\Delta t_{90 \cdot rec} = t_{10 \cdot rec} - t_{90 \cdot rec}$, for hydrogen exposure (100 mbar) of Teflon AF:Pd films coated with a PMMA layer of varying thickness (error bars denote min-max values from three measurements).

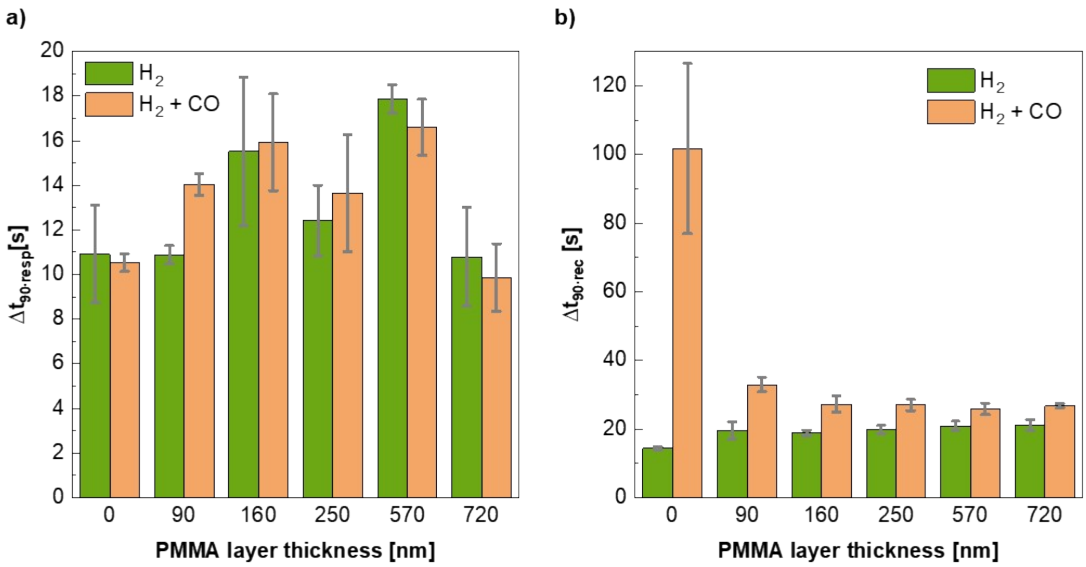

Fig. S12. a) Response time, $\Delta t_{90 \cdot resp}$, and b) recovery time, $\Delta t_{90 \cdot rec}$, for hydrogen exposure of Teflon AF:Pd films coated with a PMMA layer of varying thickness, with (green; 5 % H_2 in synthetic air) and without the presence of CO (orange; 5 % H_2 and 500 ppm CO in synthetic air).