Electronic Supplementary Material (ESI) for Sustainable Energy & Fuels.

SUPPORTING INFORMATION

Hydrogen production from formic acid decomposition in the liquid phase using Pd nanoparticles supported on CNFs with different surface properties

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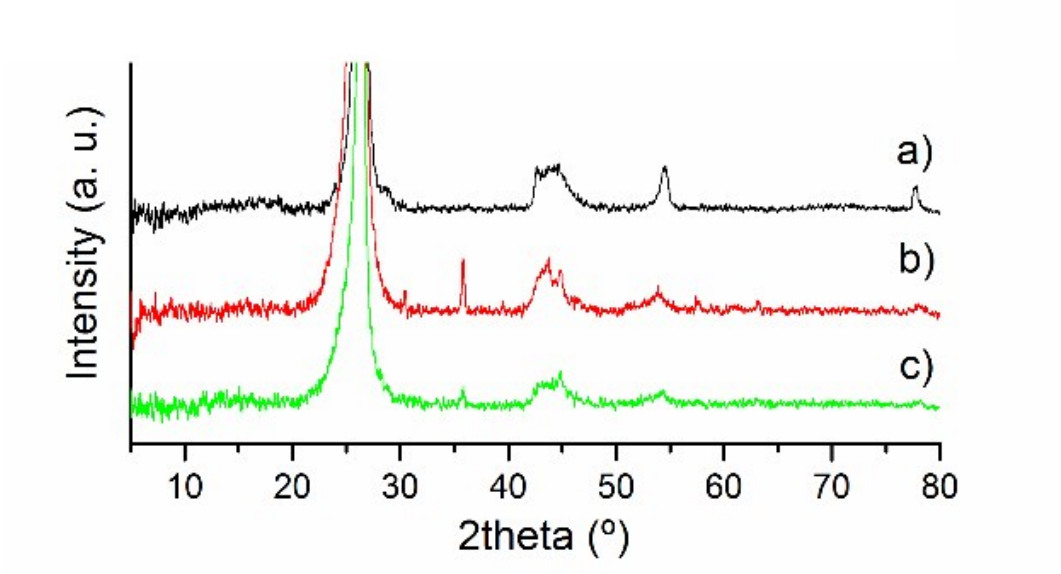

Figure S1. XRD patterns of the supports. (a) CNF-HHT, (b) CNF-LHT, (c) CNF-PS.

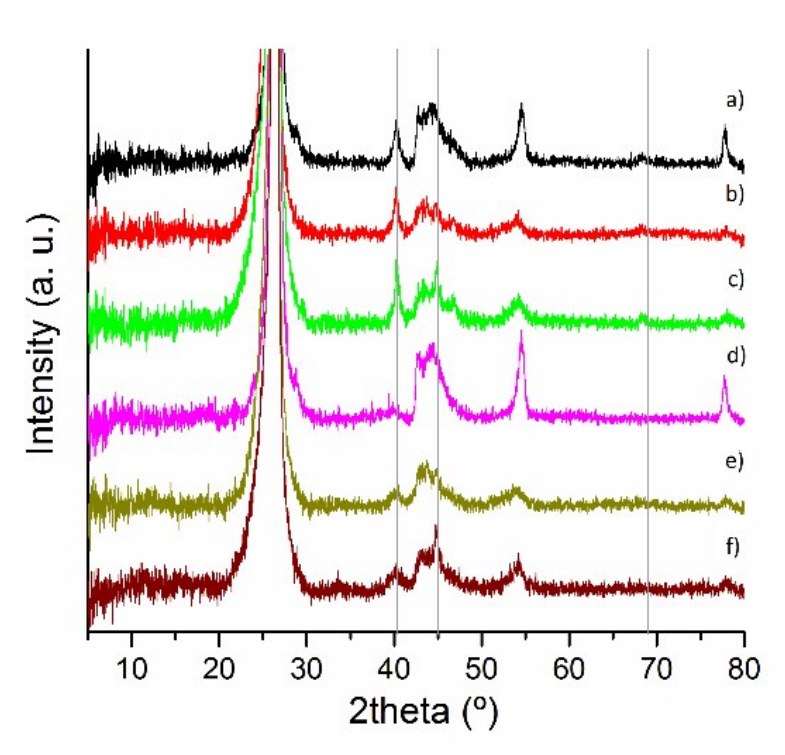

Figure S2. XRD patterns of used Pd/CNF (a) Pd_{IMP}/CNF-HHT, (b) Pd_{IMP}/CNF-LHT, (c) Pd_{IMP}/CNF-PS, (d) Pd_{SI}/CNF-HHT, (e) Pd_{SI}/CNF-LHT, (f) Pd_{SI}/CNF-PS.

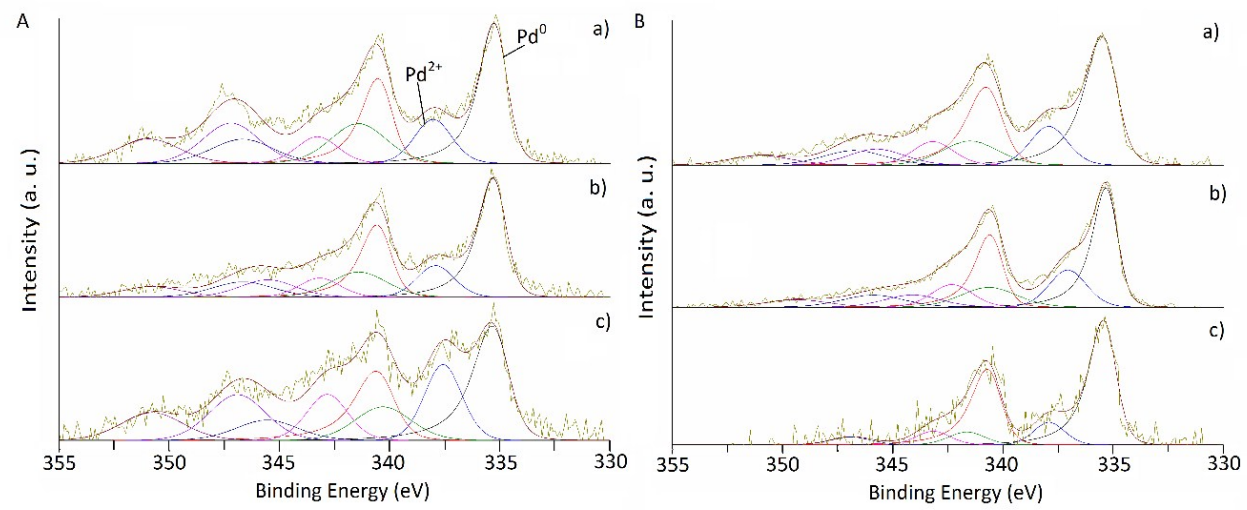

Figure S3. XPS spectra of used Pd/CNF (A) Catalyst synthesised by impregnation: (a) Pd_{IMP}/CNF-HHT, (b) Pd_{IMP}/CNF-LHT, (c) Pd_{IMP}/CNF-PS. (B) Catalysts synthesised by sol-immobilisation: (a) Pd_{SI}/CNF-HHT, (b) Pd_{SI}/CNF-LHT, (c) Pd_{SI}/CNF-PS.

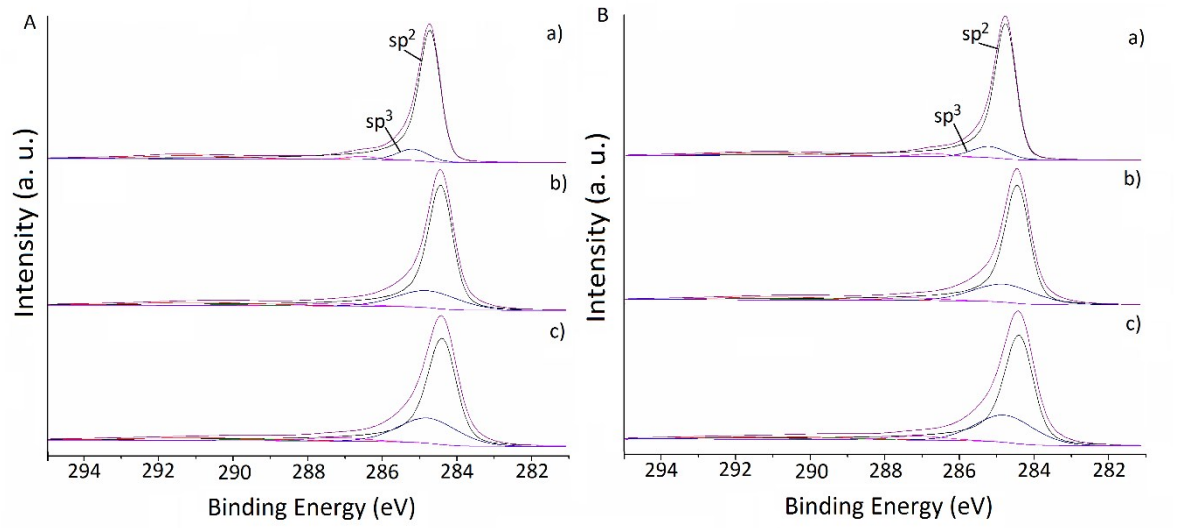

Figure S4. XPS spectra of fresh Pd/CNF in the binding energy region of 281–295 eV corresponding to C1s. (A) Catalyst synthesised by impregnation: (a) Pd_{IMP}/CNF-HHT, (b) Pd_{IMP}/CNF-LHT, (c) Pd_{IMP}/CNF-PS. (B) Catalysts synthesised by sol-immobilisation: (a) Pd_{SI}/CNF-HHT, (b) Pd_{SI}/CNF-LHT, (c) Pd_{SI}/CNF-PS.

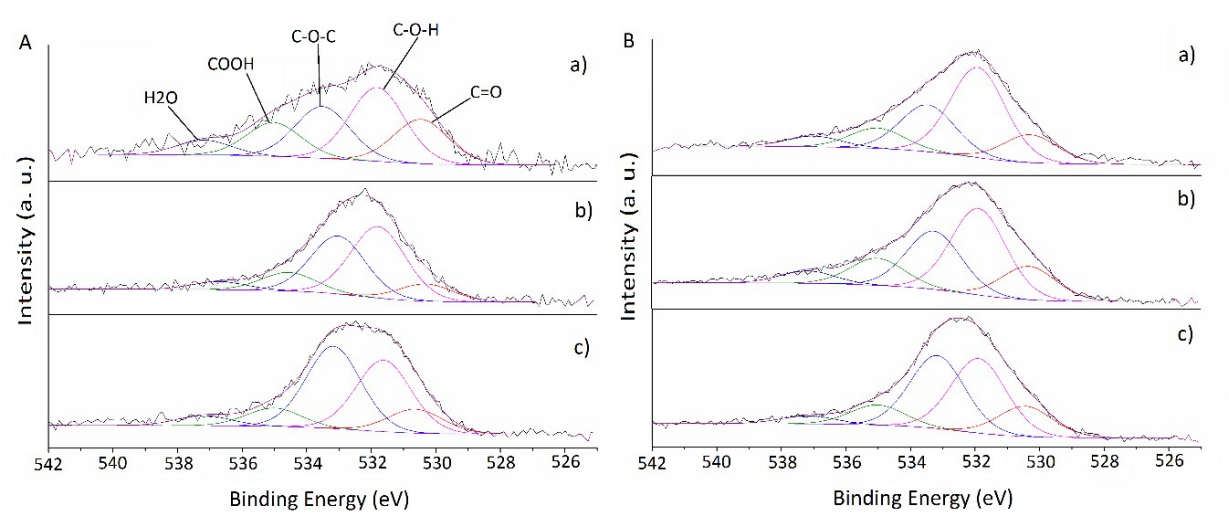

Figure S5. XPS spectra of fresh Pd/CNF in the binding energy region of 525-542 eV corresponding to O1s. (A) Catalyst synthesised by impregnation: (a) Pd_{IMP}/CNF-HHT, (b) Pd_{IMP}/CNF-LHT, (c) Pd_{IMP}/CNF-PS. (B) Catalysts synthesised by sol-immobilisation: (a) Pd_{SI}/CNF-HHT, (b) Pd_{SI}/CNF-LHT, (c) Pd_{SI}/CNF-PS.

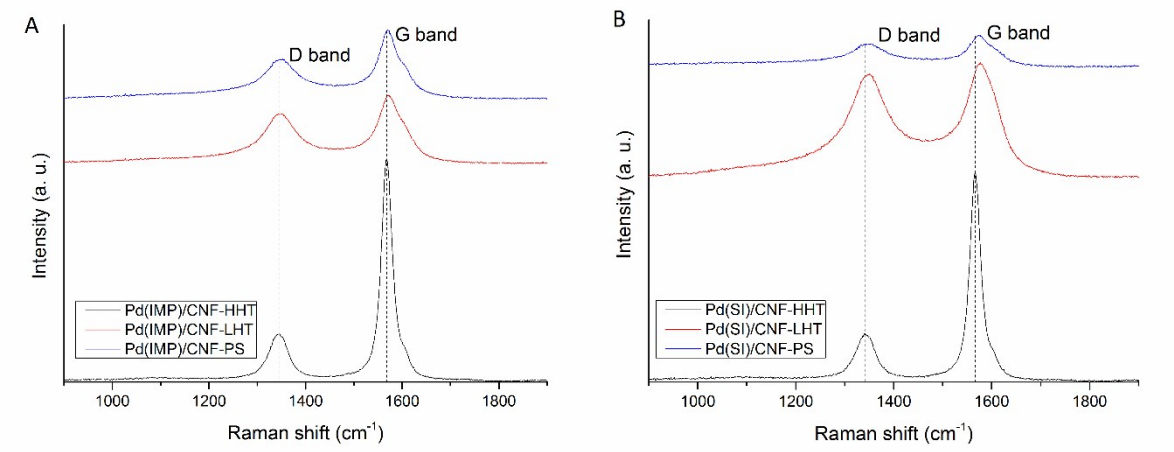

Figure S6. Raman spectra of the used samples. (A) Catalyst synthesised by impregnation: (a) Pd_{IMP}/CNF-HHT (black curve), (b) Pd_{IMP}/CNF-LHT (red curve), (c) Pd_{IMP}/CNF-PS (blue curve). (B) Catalysts synthesised by sol-immobilisation: (a) Pd_{SI}/CNF-HHT (black curve), (b) Pd_{SI}/CNF-LHT (red curve), (c) Pd_{SI}/CNF-PS (blue curve).

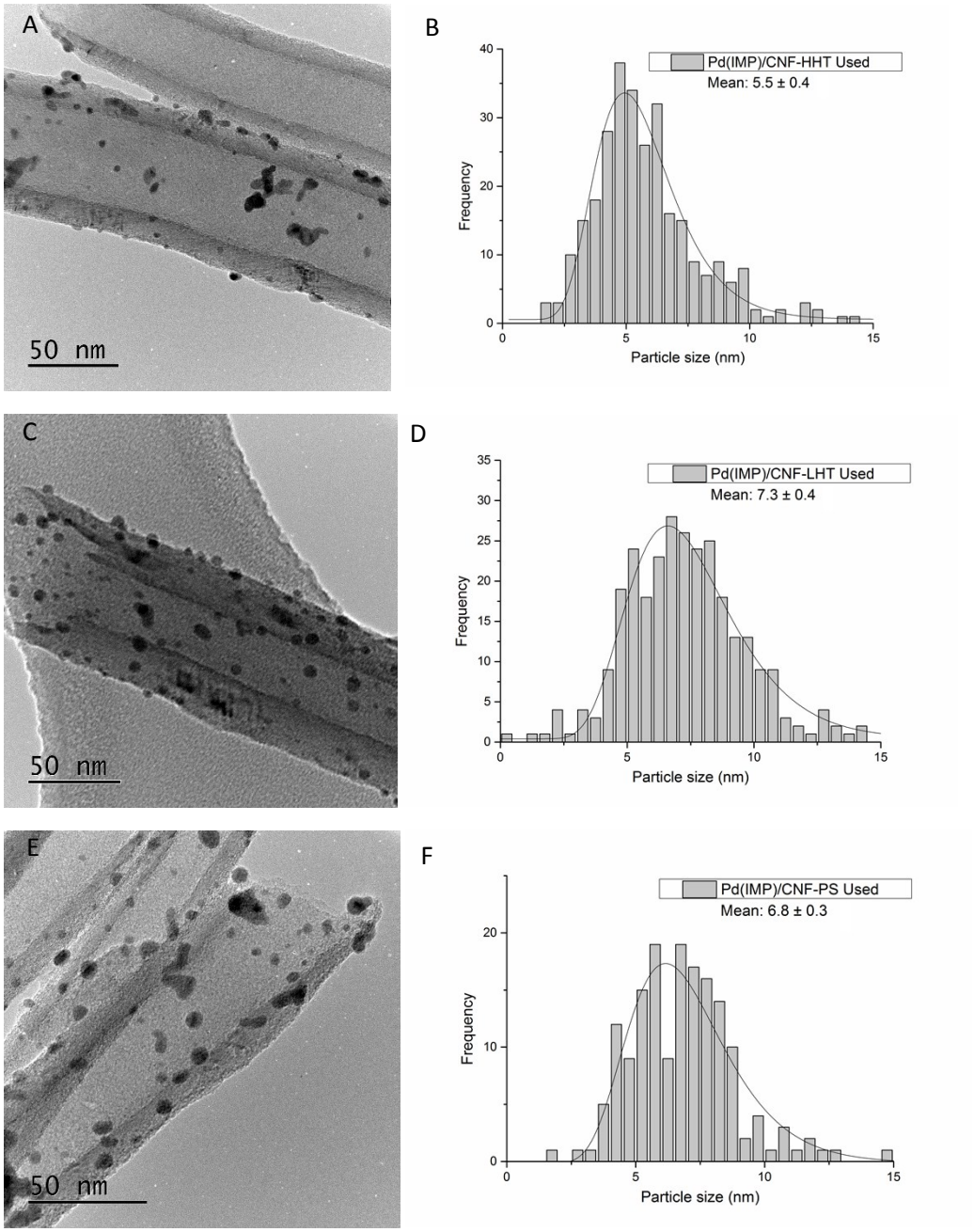

Figure S7. Bright field TEM micrographs and corresponding histograms of the particle size distributions for the used catalysts prepared by impregnation. (A,B) Pd_{IMP}/CNF-HHT, (C,D) Pd_{IMP}/CNF-LHT, (E,F) Pd_{IMP}/CNF-PS.

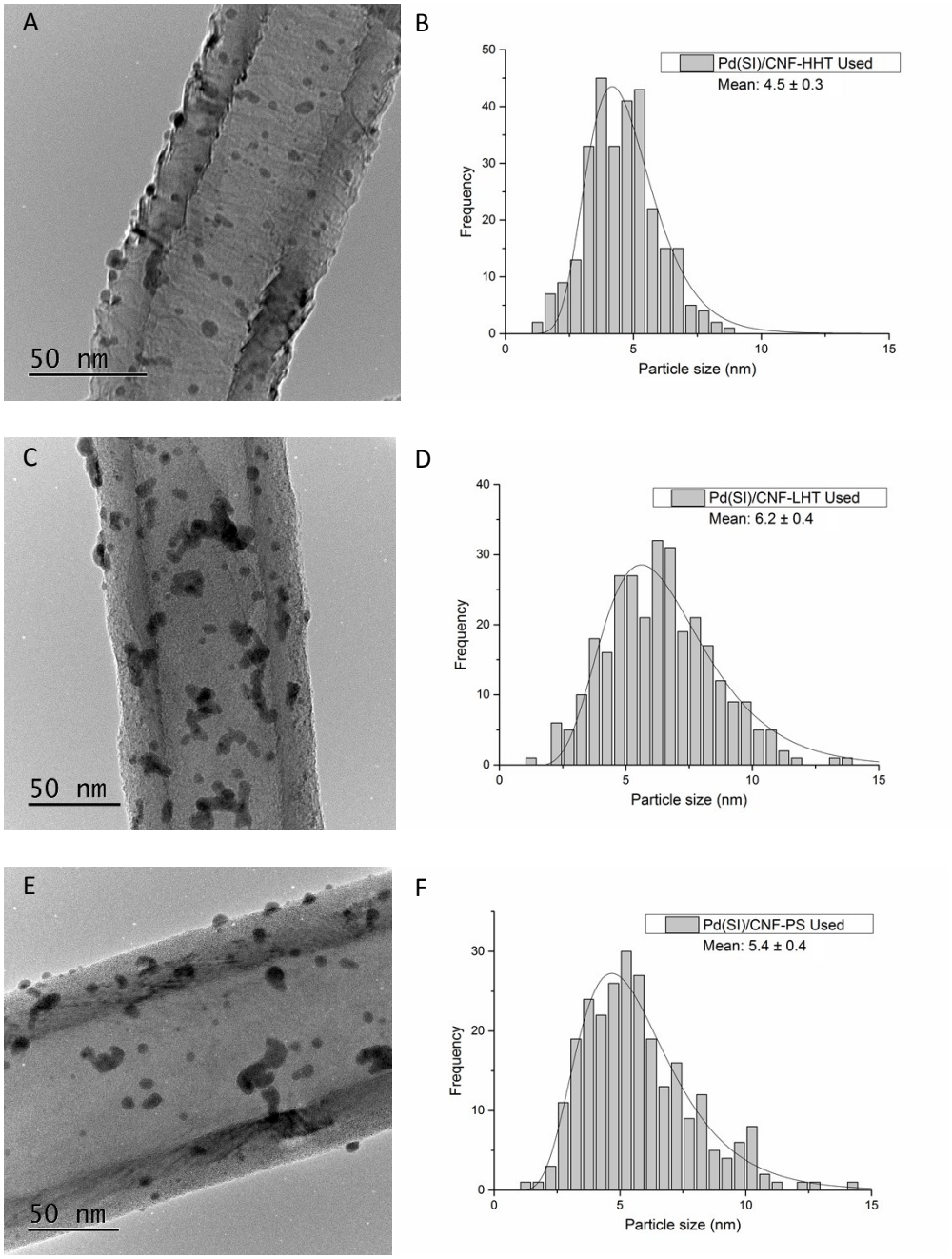

Figure S8. Bright field TEM micrographs and corresponding histograms of the particle size distributions for the used catalysts prepared by sol-immobilisation. (A,B) Pd_{SI}/CNF-HHT, (C,D) Pd_{SI}/CNF-LHT, (E,F) Pd_{SI}/CNF-PS.

Catalyst	Temp (°C)	H_2 (%)	CO_2 (%)	CO (ppm)	CO/CO_2
Pd_{IMP}/CNF-HHT	30	6.3	5.7	14.7	0.000258
Pd_{SI}/CNF-HHT	30	5.9	6.3	11.0	0.000175

Table S1. Concentrations of H_2, CO_2 and CO evolved at 30 °C and ratio CO/CO_2.