Supplementary Information

Improving the electrocatalytic activity of Pd nanoparticles through electronic coupling interaction with a Ni_2P–MoS_2 hybrid support for ethanol electrooxidation in an alkaline medium

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Table S1. Current loss in percentage obtained from durability test employing chronoamperometry and cyclic voltammetry after 10000 s and 500 cycles, respectively.

Electrocatalyst	*Rate of current loss σ $(\%s^{-1})$	Current loss (%)		Remarks
		CA	CV	
Pd/Ni_2P-MoS_2	1.63 x 10^{-3}	66.81	11	• MoS_2-(Pd)-Ni_2P Synergy enhances the stability and dispersion of Pd nanoparticles and a high density of active sites. • Strong support for metal interaction and combination of electronic, geometric, and synergistic.
Pd/Ni_2P	3.06 x 10^{-3}	76.03	15	• Electronic Interactions lead to alterations in the electronic structure of both materials.
Pd/C	3.94 x 10^{-3}	82.70	21	• Compromised Pd NPs on carbon (agglomeration, coalition)
Pd/MoS_2	0.014	91.53	42	• Pd phase transitions leading to loss of active surface area hence reduced active site

* $\sigma(\%s^{-1}) = \frac{100}{I_0}(\frac{dI}{dt})_{t>2500s}$, long term poisoning rate. We propose that the calculation of $\sigma(\%s^{-1})$ for chronoamperometry is a better way of data evaluation as this equation can used in the predetermination of stability. The reason is that the calculation involves the rate of change in the current decay trajectory with time. Hence, it is more suited and can be used in place of the I_f/I_b ratio.

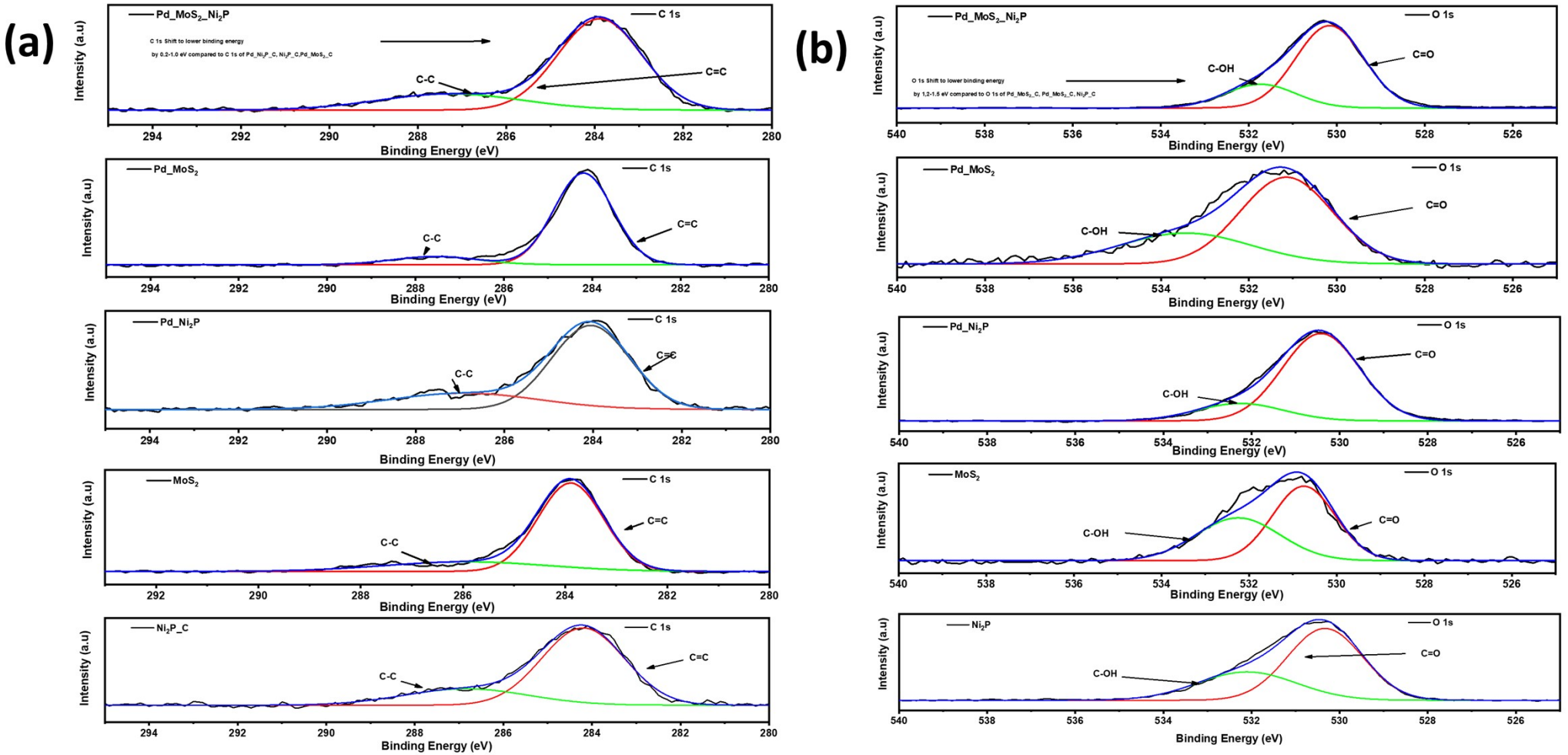

Figure S1: XPS spectra for C 1s and O 1s.

Table S2: Comparison of the mass activity of the prepared electrocatalysts with those reported in the literature for ethanol electrooxidation.

Electrocatalyst	**Electrolyte**	**Current density (i_f)**	**Scan rate ($mV \cdot s^{-1}$)**	**Reference**
Pd/Ni_2P-MoS_2	0.5 M Ethanol + 1 M KOH	1579 mA mg^{-1}_{Pd}	50	This work
Pd/Ni_2P	0.5 M Ethanol + 1 M KOH	314.8 mA mg^{-1}_{Pd}	50	This work
Pd/MoS_2	0.5 M Ethanol + 1 M KOH	69.2 mA mg^{-1}_{Pd}	50	This work
Pd–NiO (6:1 by weight)/C	1 M Ethanol + 1 M KOH	95 mA cm^{-2}	50	[1]
Pd_2Ru/C	1.0 M NaOH + 1.0 M ethanol	23 mA cm^{-2}	50	[2]
10%Pd–10%Ag/C	1 M Ethanol + 1 M KOH	~3.7 mA cm^{-2}	50	[3]
Pd/C	Ethanol + 1 M NaOH	~16 mA cm^{-2}	50	[4]

References

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