

Electronic Supplementary Information for

**Heterointerface engineering of Rh/Pd metallene for hydrazine oxidation-assisted
energy-saving hydrogen production**

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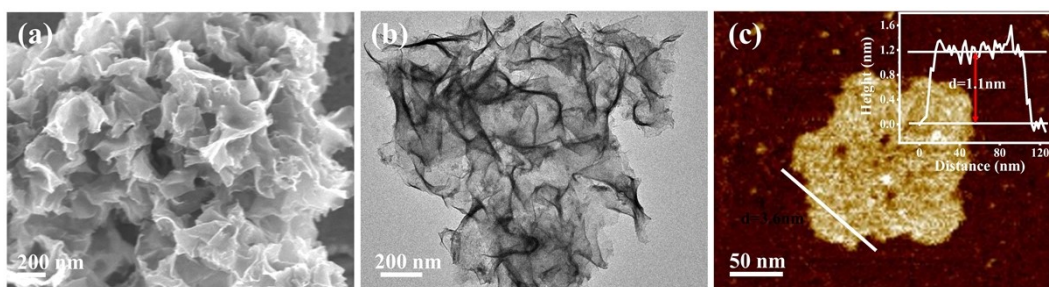


Fig. S1 (a) SEM, (b)TEM and (c) AFM images of Pd metallene.

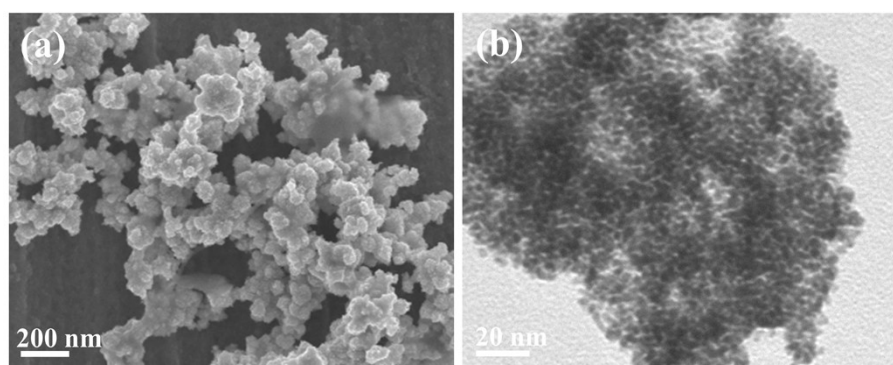


Fig. S2 (a) SEM and (b) TEM images of Rh Nanoparticles.

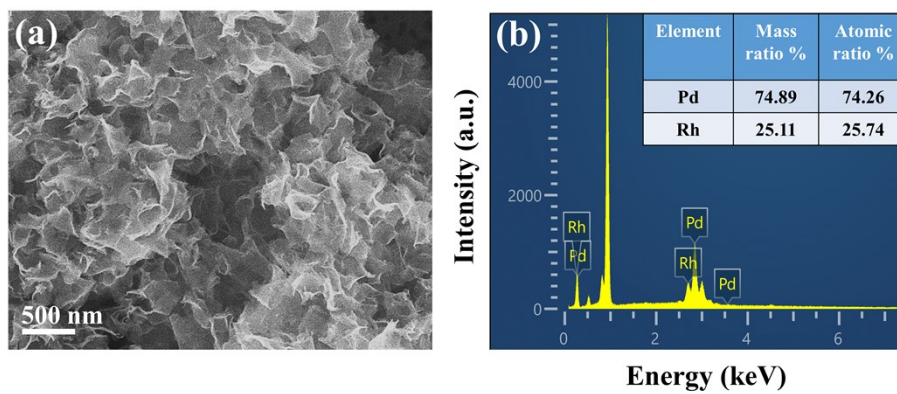


Fig. S3 (a) SEM image and (b) corresponding EDX spectrum as well as element amounts of Rh/Pd metallene.

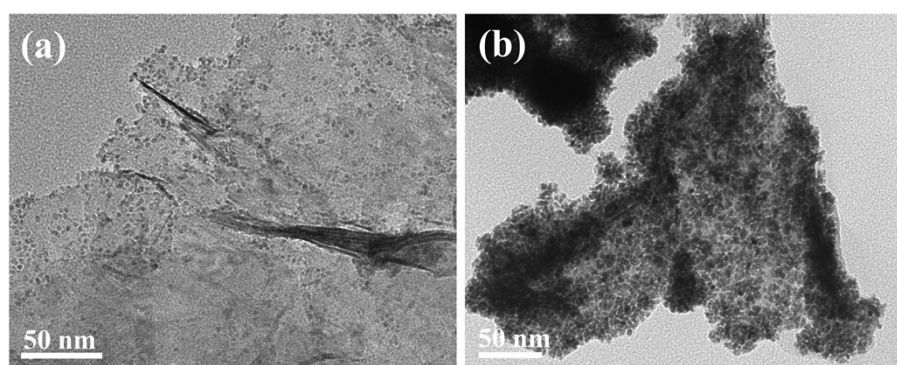


Fig. S4 TEM images of the (a) L-Rh/Pd metallene and (b) H-Rh/Pd metallene

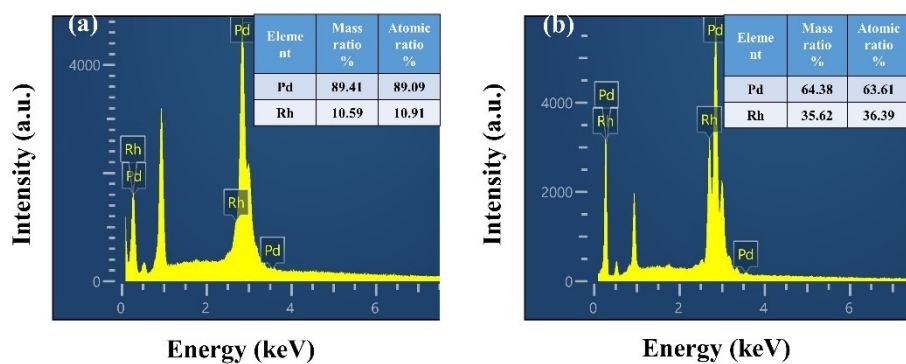


Fig. S5 EDX spectra and element compositions of L-Rh/Pd metallene and H-Rh/Pd metallene.

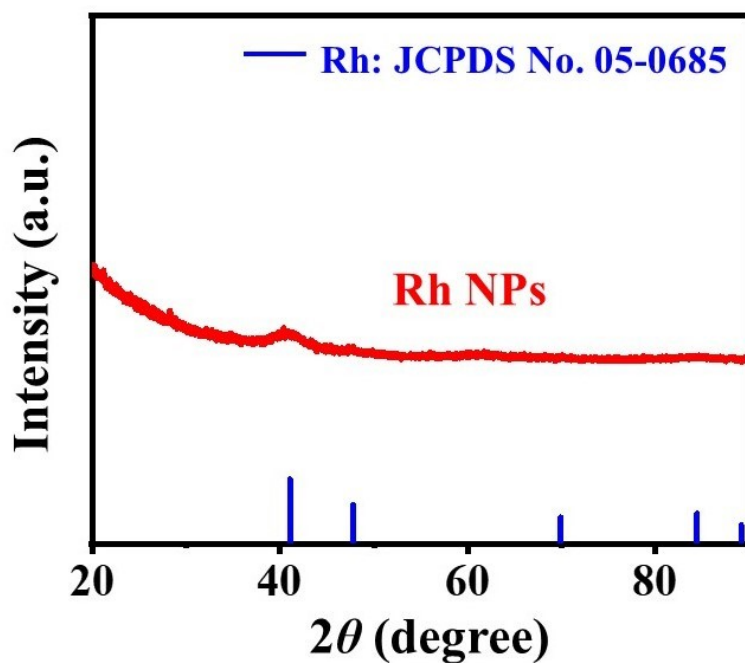


Fig. S6 XRD pattern of Rh NPs

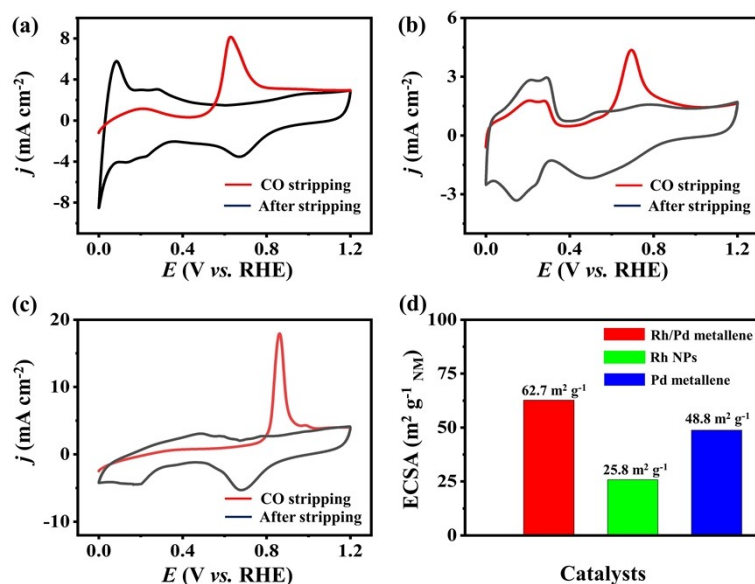


Fig. S7 CO stripping measurements of (a) Rh/Pd metallene, (b) Rh nanoparticles, (c) Pd metallene in 1 M KOH at a scan rate of 20 mV s⁻¹ and (d) their corresponding ECSA values.

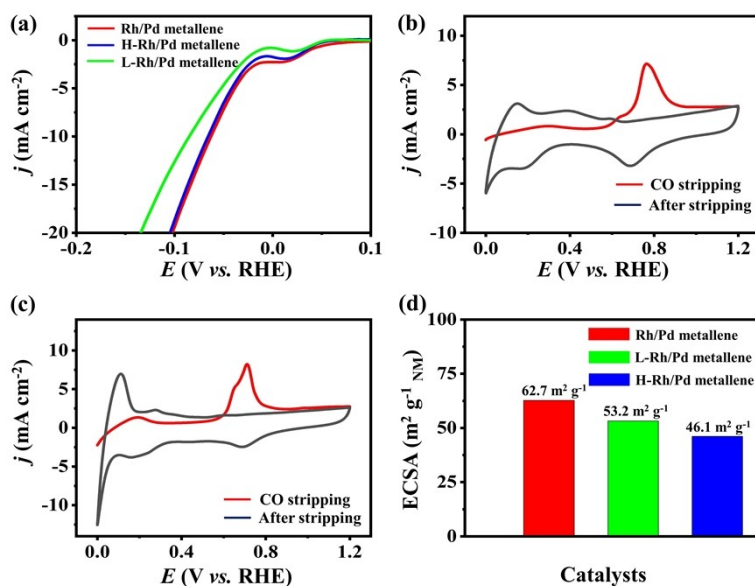


Fig. S8 (a) LSV curves of samples for HER in 1 M KOH. CO stripping measurements of (b) L-Rh/Pd metallene and (c) H-Rh/Pd metallene in 1 M KOH at 20 mV s⁻¹ and (d) their corresponding ECSA values.

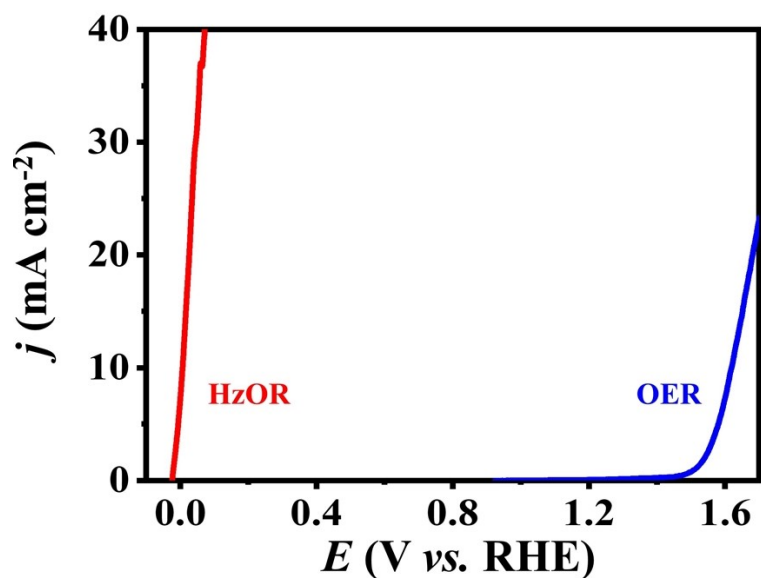


Fig. S9 The LSV curves of Rh/Pd metallene for HzOR in 1.0 M KOH + 0.1 M N₂H₄ and OER in 1.0 M KOH.

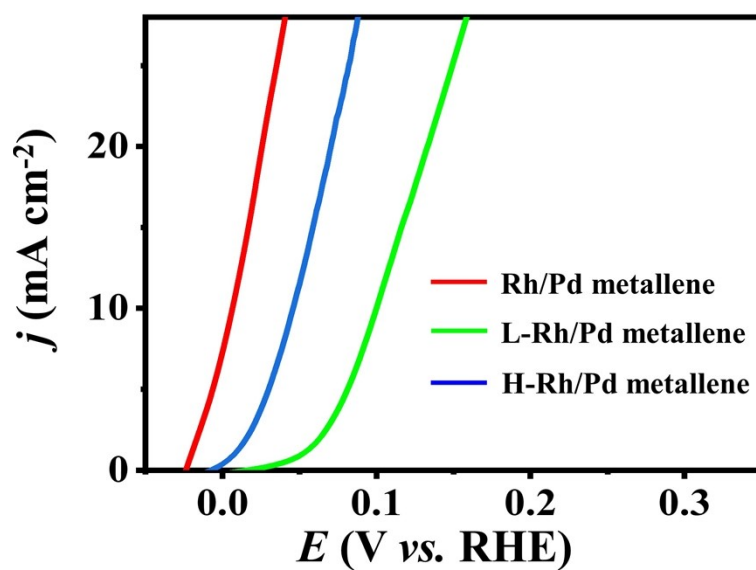


Fig. S10 The LSV curves of Rh/Pd metallene, L-Rh/Pd metallene and H-Rh/Pd metallene for HzOR in 1.0 M KOH + 0.1 M N₂H₄.

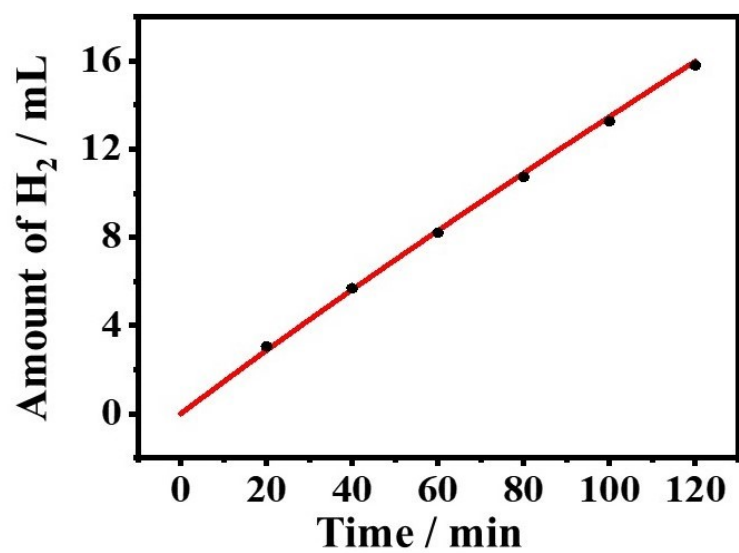


Fig. S11 The relationship between the amounts of generated H₂ and theoretically calculated H₂ along with the increase of electrolysis time.

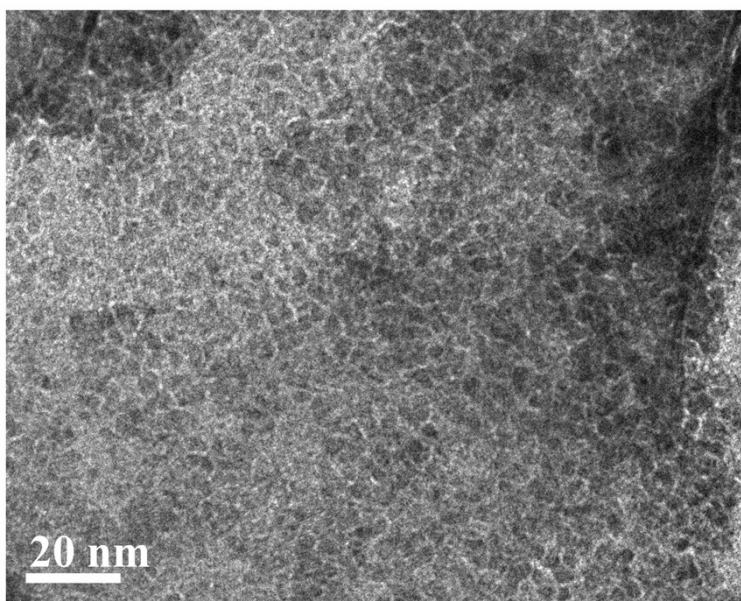


Fig. S12 TEM image of Rh/Pd metallene after stability test.

Table S1 The comparison of OHZS performance of Rh/Pd metallene with the representative reported catalyst.

Catalyst	Condition	Current Density	Cell voltage	Ref.
Rh/Pd metallene	1 M KOH/0.1 M N₂H₄	10 mA cm⁻²	0.050 V	This work
l-Rh metallene	1 M KOH/0.1 M N ₂ H ₄	10 mA cm ⁻²	0.028 V	1
a-RhPb NFs	1 M KOH/0.1 M N ₂ H ₄	10 mA cm ⁻²	0.095 V	2
Rh ₂ S ₃ /NC	1 M KOH/0.1 M N ₂ H ₄	10 mA cm ⁻²	0.108 V	3
Ru-MPNC	1 M KOH/0.5 M N ₂ H ₄	50 mA cm ⁻²	0.149 V	4
Rh/RhOx	1 M KOH/0.5 M N ₂ H ₄	10 mA cm ⁻²	0.068 V	5
RuP ₂ NPs	1 M KOH/0.5 M N ₂ H ₄	10 mA cm ⁻²	0.023 V	6
CC@WO ₃ /Ru SAs	1 M KOH/0.5 M N ₂ H ₄	10 mA cm ⁻²	0.025 V	7
RhIr MNs	1 M KOH/0.5 M N ₂ H ₄	10 mA cm ⁻²	0.130 V	8
Rh NCs	1 M KOH/1 M N ₂ H ₄	10 mA cm ⁻²	0.223 V	9

References

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