

Phosphorus-Tuned Co-P Coatings for High-Performance Water Splitting and
Hydrogen Production

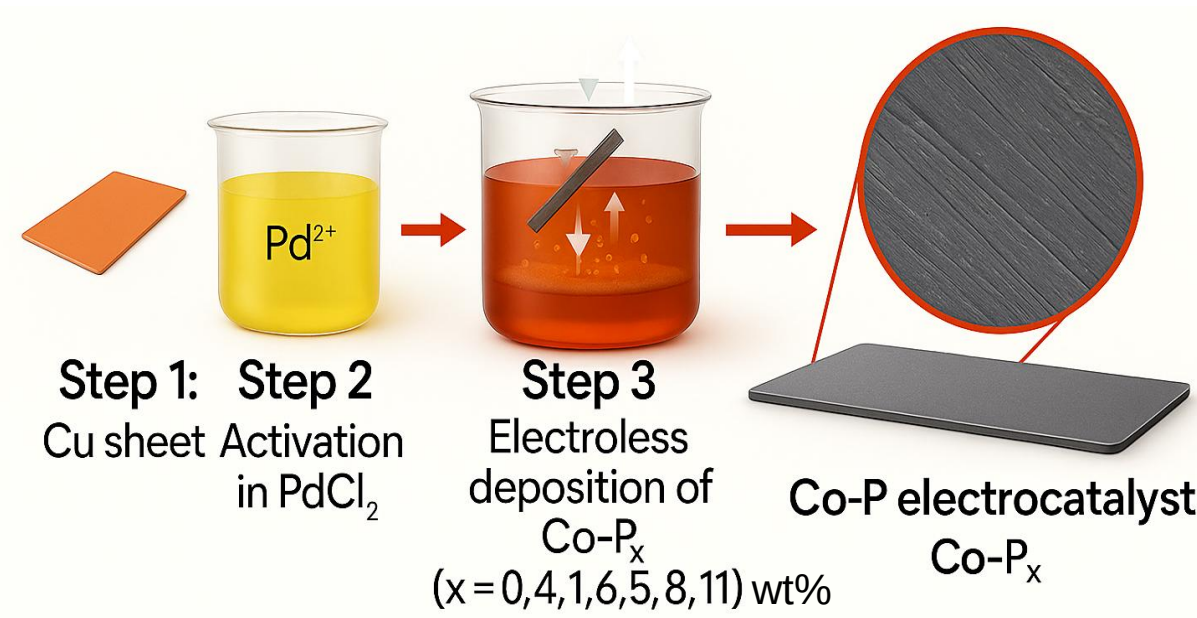
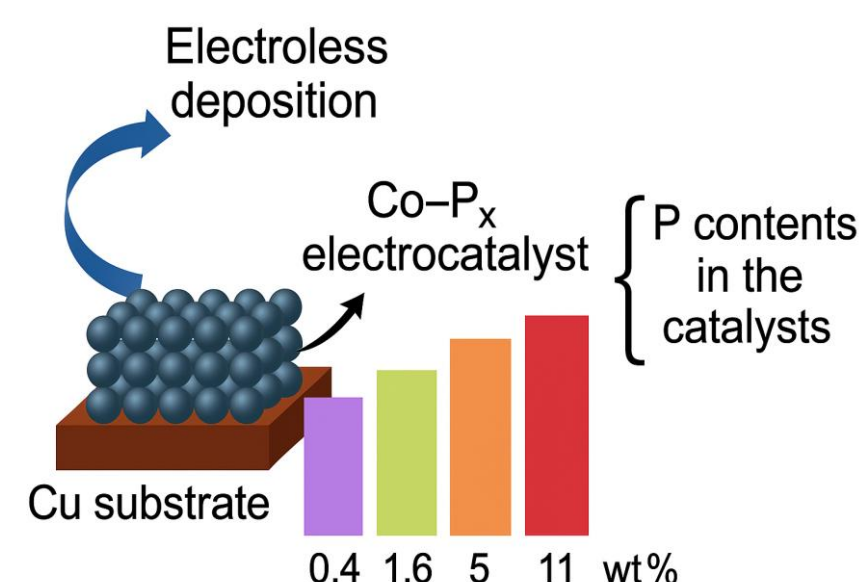
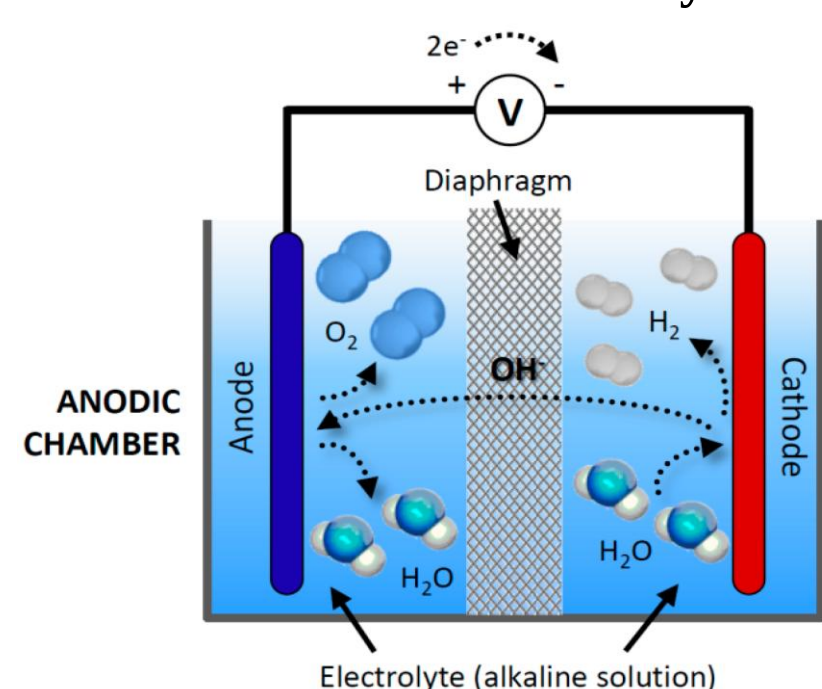
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INTRODUCTION & AIM

Alkaline Water Electrolysis Cell



METHOD

Table 1. Composition of CoP coatings deposited on Cu surface via EDX analysis.

Catalyst	Element, wt%	
	Co	P
Co-P _{0.4} /Cu	99.62	0.38
Co-P _{1.6} /Cu	98.45	1.55
Co-P ₅ /Cu	95.13	4.87
Co-P ₈ /Cu	92.02	7.98
Co-P ₁₁ /Cu	88.87	11.13

RESULTS & DISCUSSION

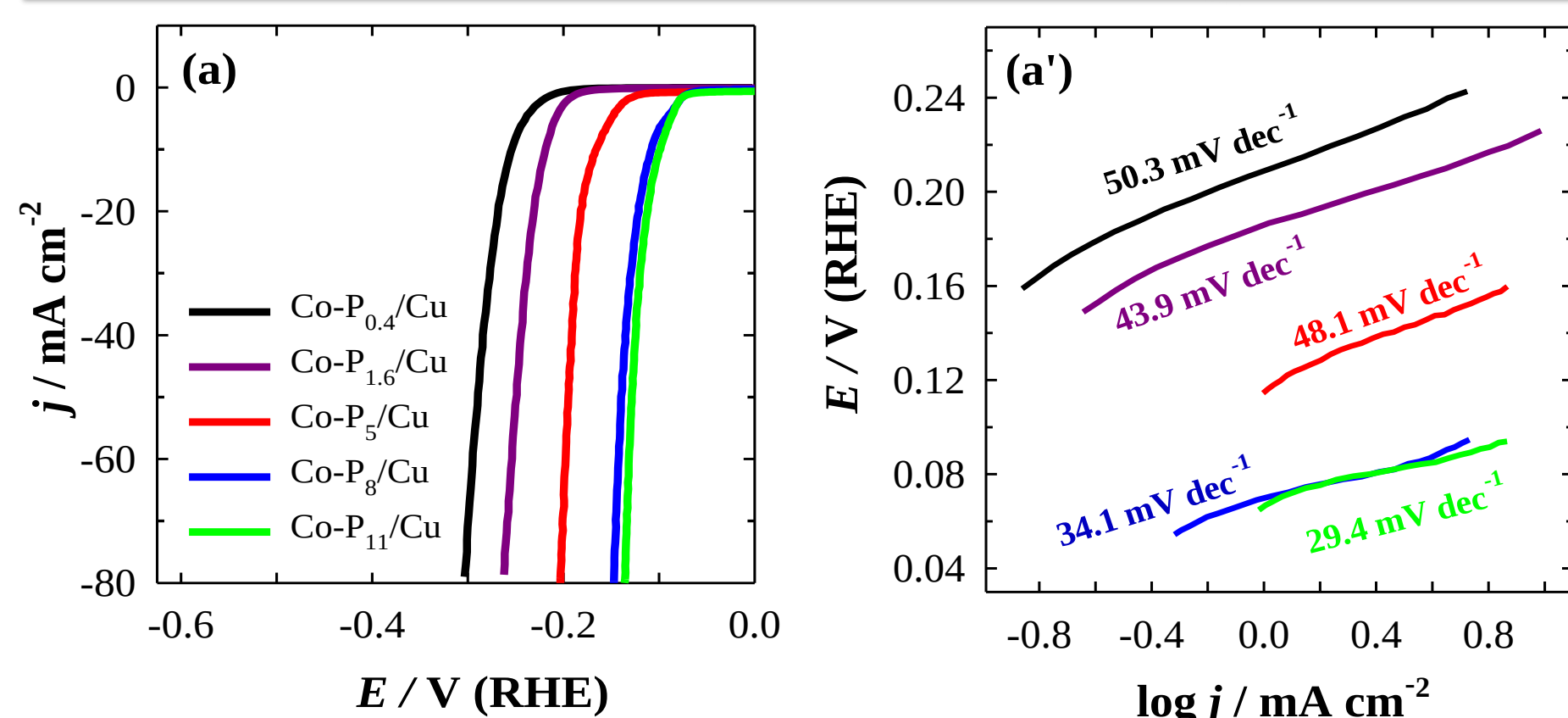


Fig. 2. HER LSVs (a) and Tafel Slopes (a') of the investigated catalysts recorded in a 1M KOH solution at 2mV/s.

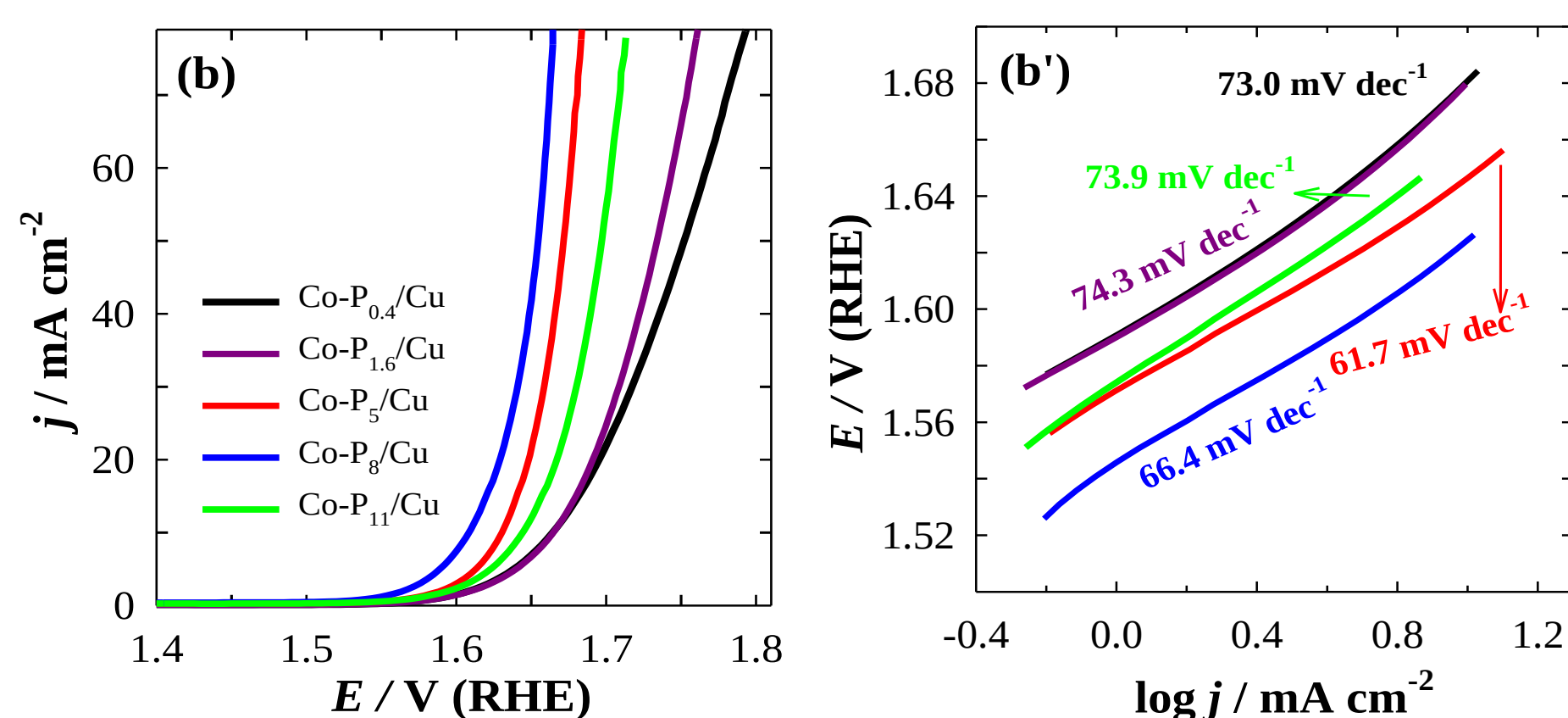
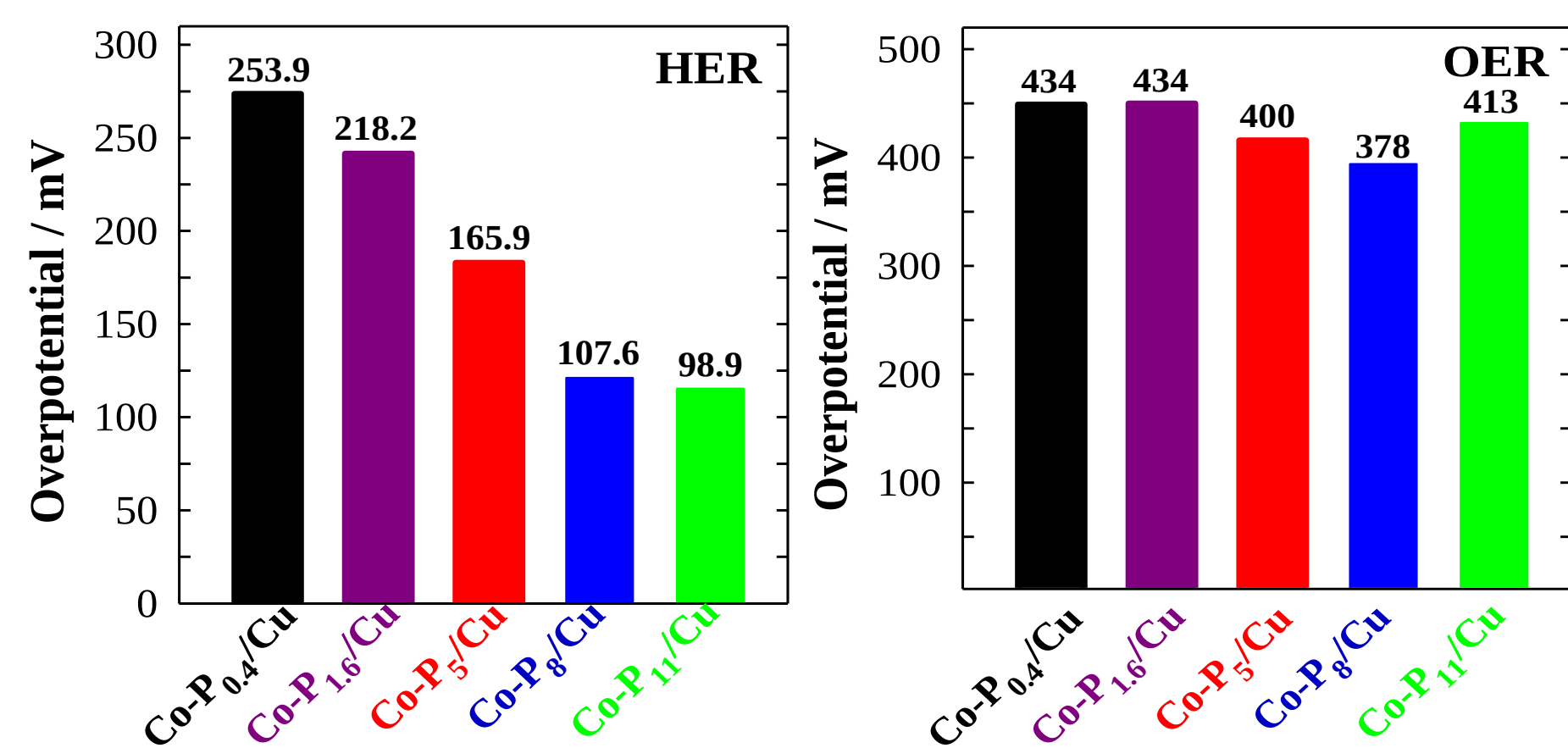


Fig. 3. OER LSVs (b) and Tafel Slopes (b') of the investigated catalysts recorded in a 1M KOH solution at 2mV/s.

Fig. 4. HER overpotential column bar to reach a current density of 10 mA cm⁻².Fig. 5. OER overpotential column bar to reach a current density of 10 mA cm⁻².

CONCLUSION

- Co-P₁₁/Cu shows the best HER performance with the lowest overpotential (98.9 mV) and smallest Tafel slope (29.4 mV dec⁻¹).
- Co-P₈/Cu gives the best OER activity with the lowest overpotential (378 mV) and minimum Tafel slope (66.4 mV dec⁻¹).
- Best overall water splitting (OWS) is achieved by Co-P₁₁/Cu || Co-P₁₁/Cu, requiring only ~1.81 V at 10 mA cm⁻².
- Co-P₁₁/Cu also shows the highest ECSA and excellent durability, remaining stable for 15 hours and after 1000 cycles.

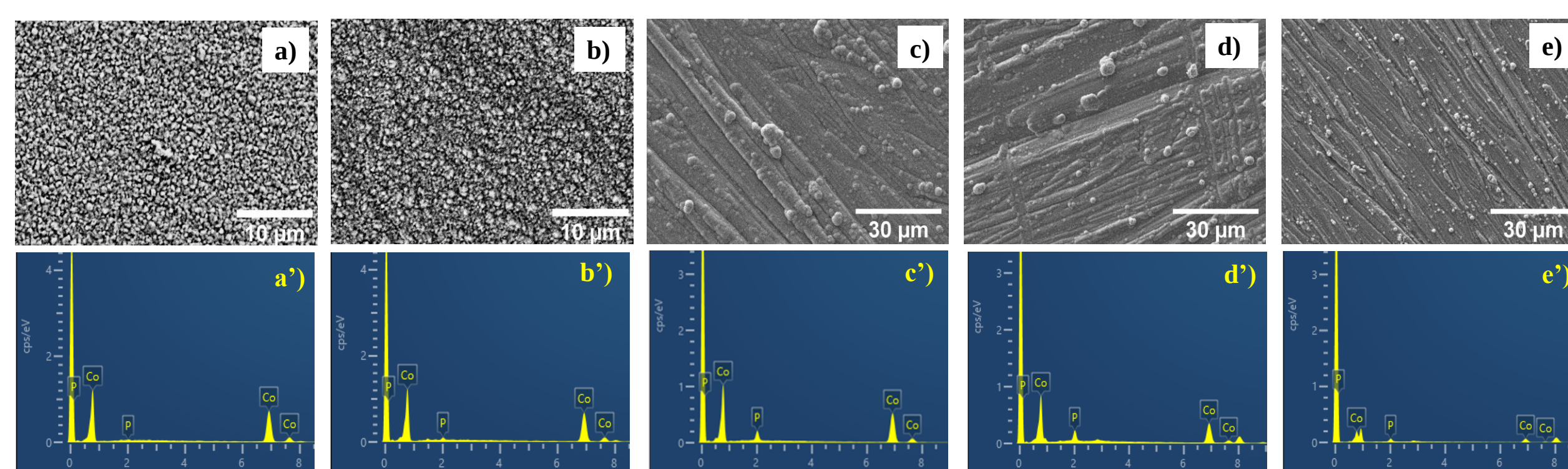


Fig. 1. SEM views of Co-P coatings with P content of 0.4 (a), 1.6 (b), 5 (c), 8 (d), and 11 (e) wt% deposited on Cu surface. (a'-e') The corresponding EDX spectra.

RESULTS & DISCUSSION

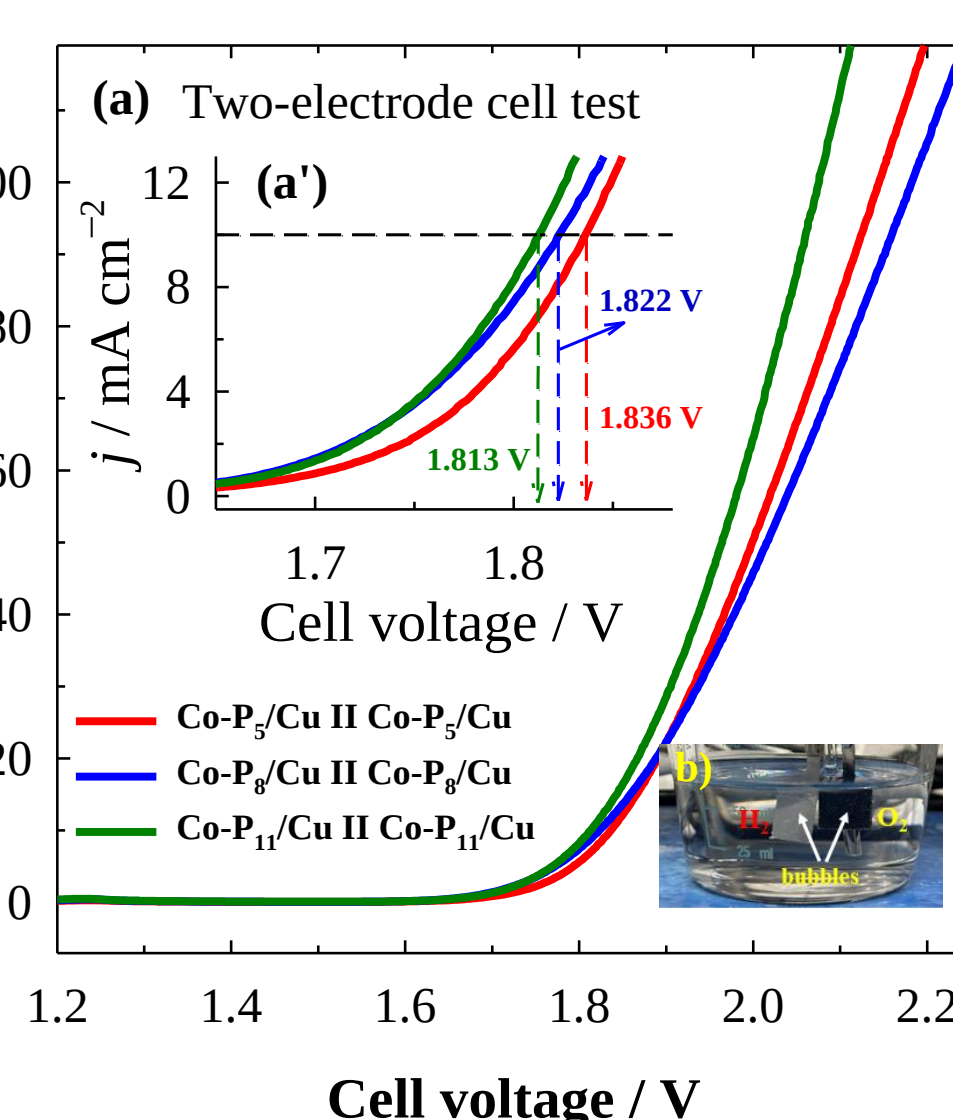
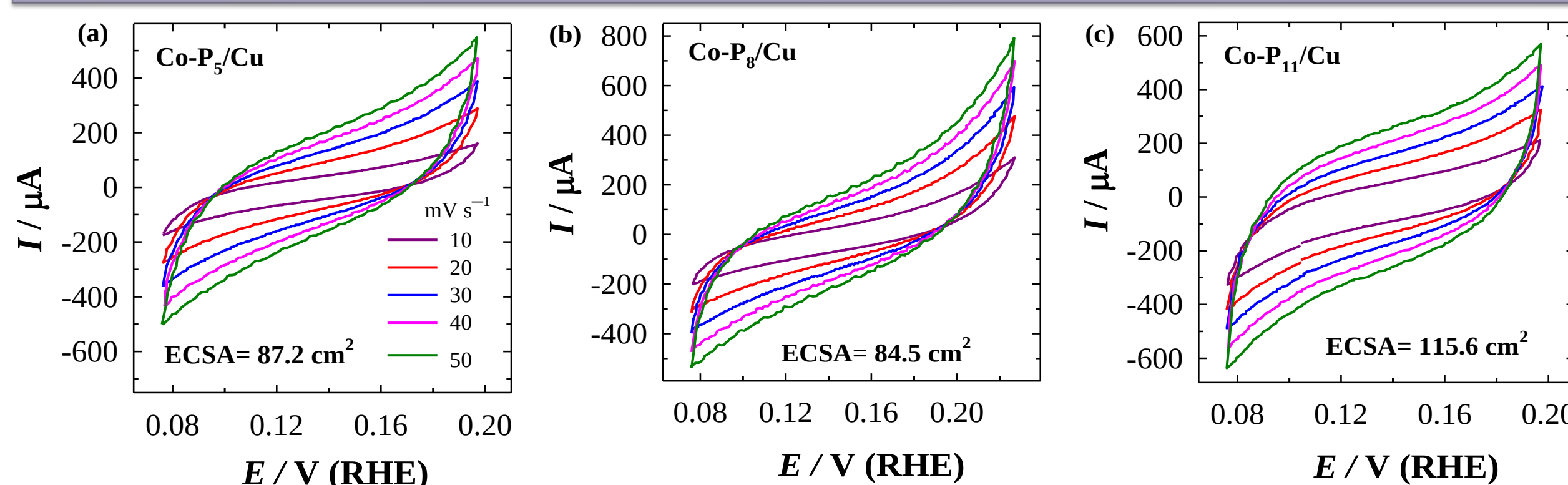
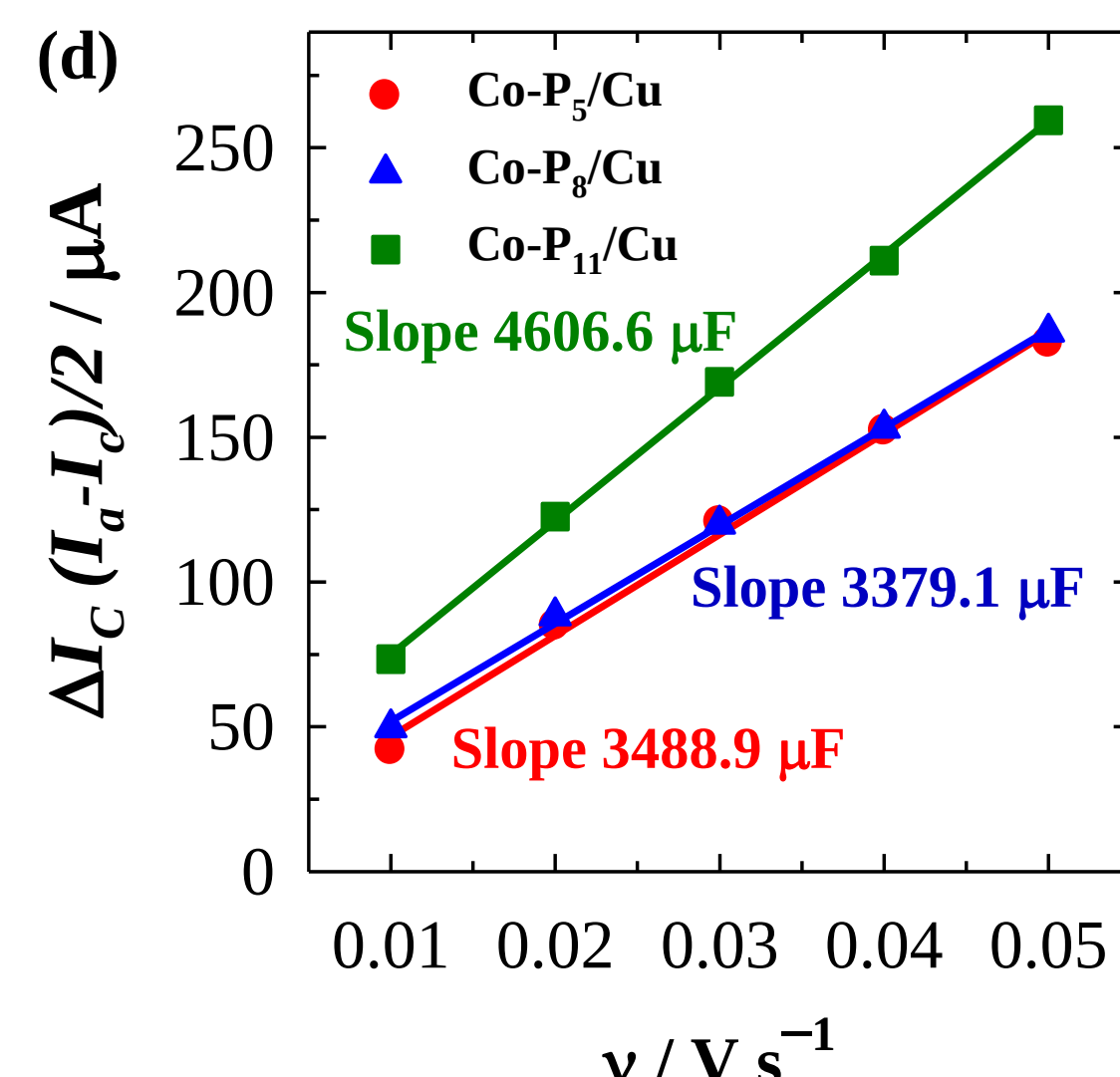


Fig. 6. LSVs (a) for different Co-P/Cu catalysts as both anode and cathode electrocatalytic water splitting in 1 M KOH solution. (b) Photograph of OWS on Co-P/Cu as cathode and anode.

Fig. 7. CVs of (a) Co-P/Cu (5 wt% P), (b) Co-P/Cu (8 wt%), and (c) Co-P/Cu (11 wt%) in N₂-saturated 1 M KOH in the non-faradaic potential region at different scan rates. (d) Capacitive current as a function of scan rate.

REFERENCE

Amber, H., Balčiūnaitė, A., Sukackienė, Z., Tamašauskaitė-Tamašiūnaitė, L., & Norkus, E. (2024). Electrolessly Deposited Cobalt–Phosphorus Coatings for Efficient Hydrogen and Oxygen Evolution Reactions. *Catalysts*, 15(1), 8.

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