

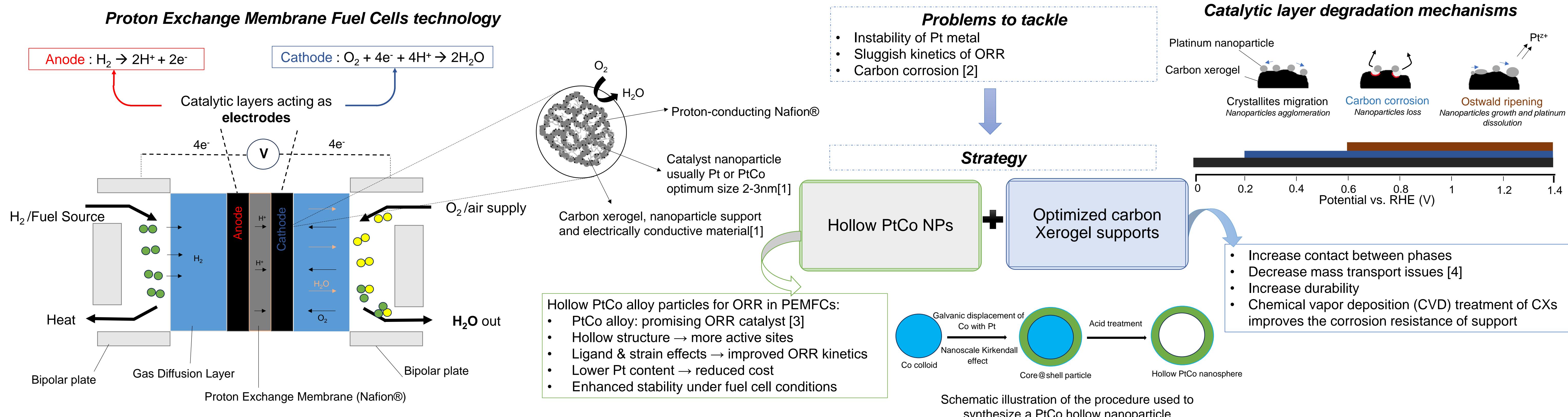
# Development of hollow bimetallic catalysts supported on nanostructured carbons for sustainable PEM fuel cell electrodes

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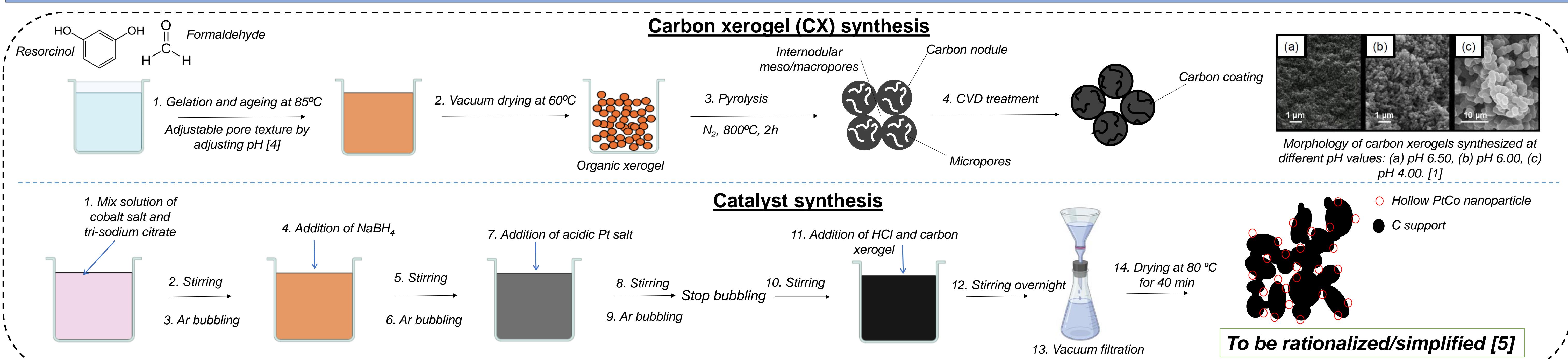
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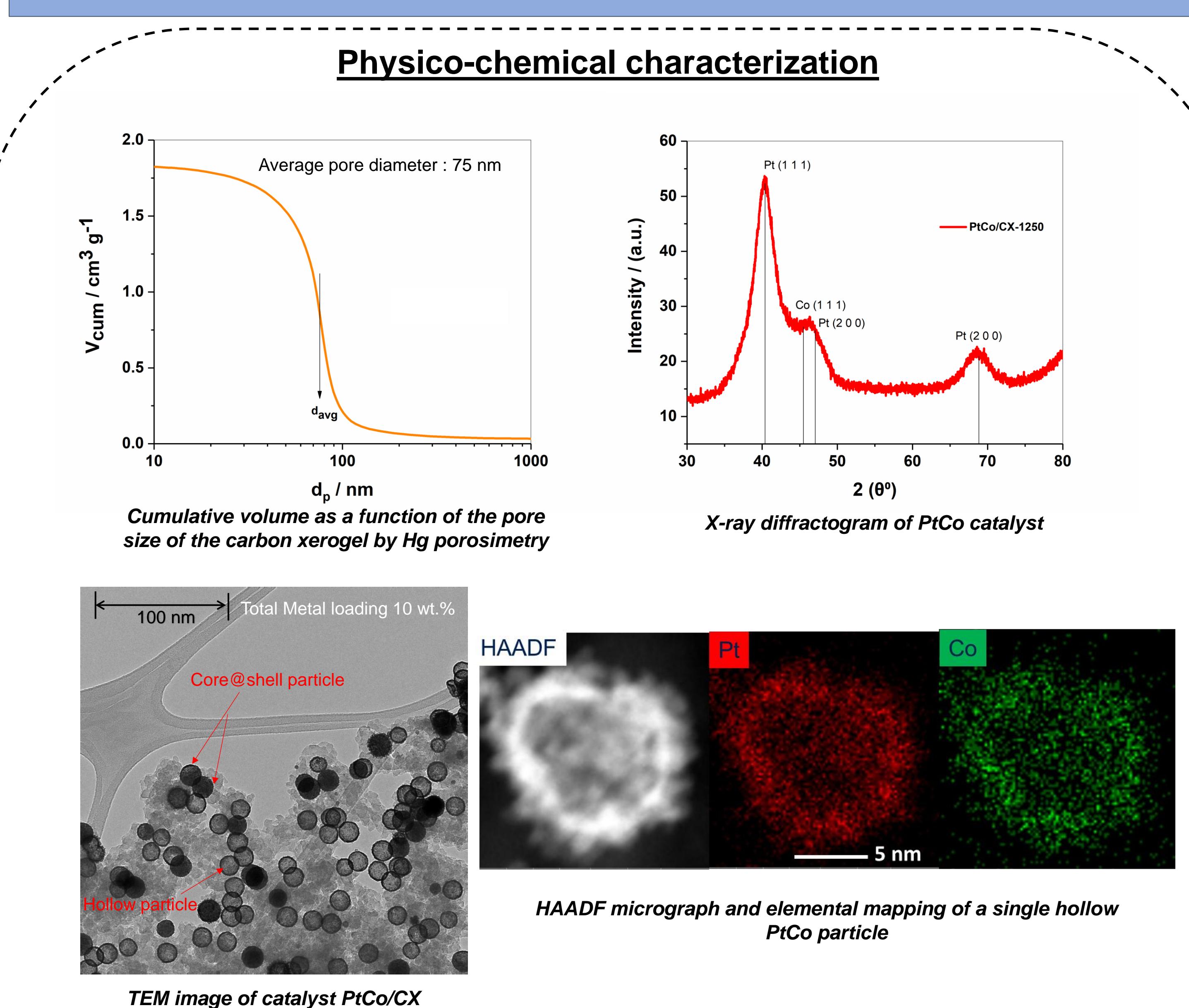
## CONTEXT



## SYNTHESIS



## RESULTS



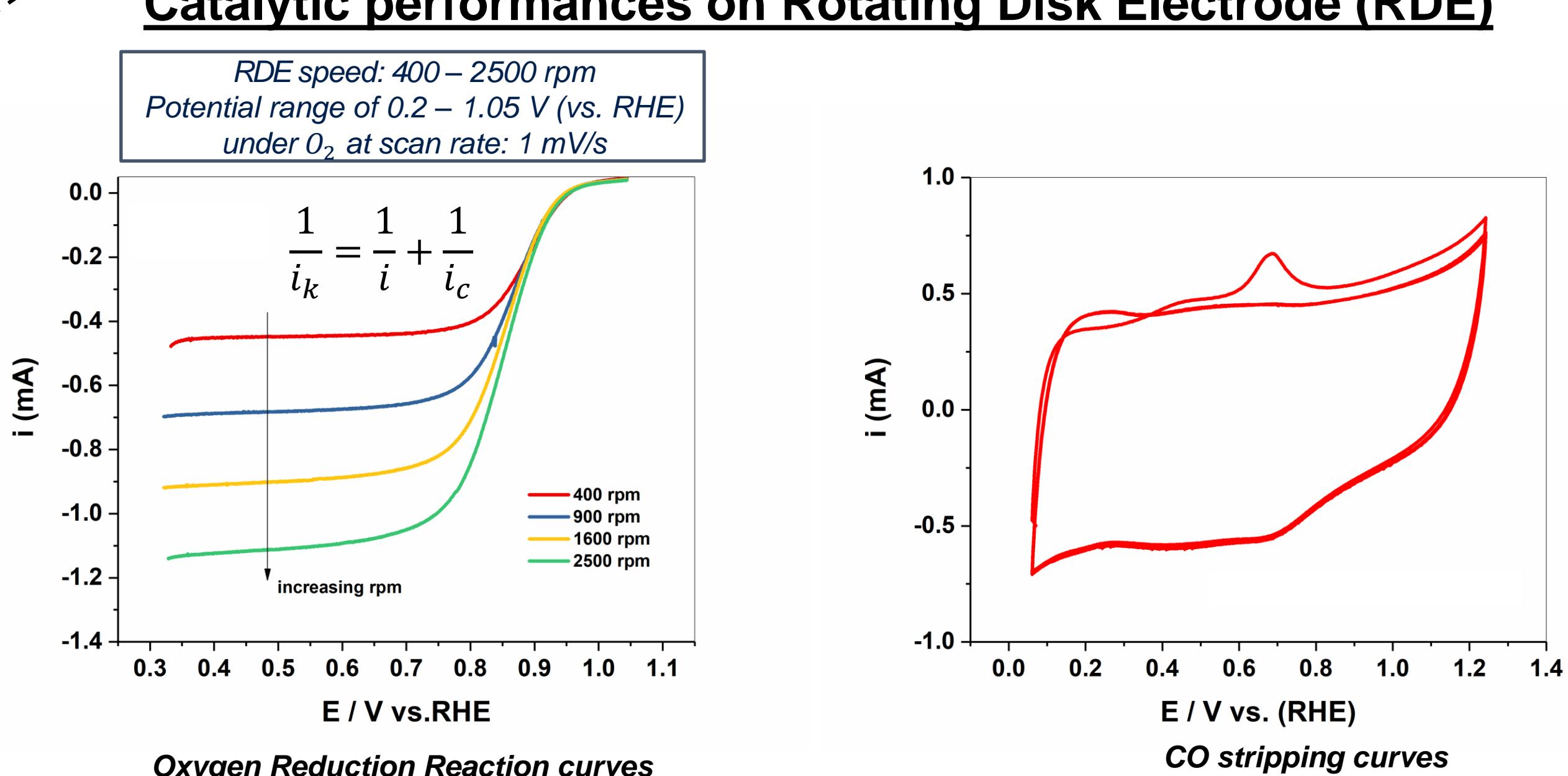
Catalyst properties determined from physicochemical analyses

Catalyst	ICP-AES		TEM						XRD	
	Pt <sub>ICP</sub> at.%	Co <sub>ICP</sub> at.%	d <sub>TEM</sub> (nm)	$\sigma$ (nm)	d <sub>s</sub> (nm)	d <sub>v</sub> (nm)	t <sub>TEM</sub> (nm)	$\sigma_{TEM}$ (nm)	t <sub>v</sub> (nm)	
PtCo/CX-1000	60	40	46	7.0	48	49	3.0	0.6	3.3	3.4
PtCo/CX-1250	85	15	58	4.0	58	59	3.5	0.6	3.3	3.6
PtCo/CX-1400	74	26	56	7.6	58	59	3.4	0.4	3.6	3.3

## REFERENCES

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## Catalytic performances on Rotating Disk Electrode (RDE)



	ECSCA ( $m^2/g_{Pt}$ ) $\pm 10\%$	SA ( $A/m^2_{Pt}$ ) $\pm 10\%$	MA ( $A/g_{Pt}$ ) $\pm 10\%$
Commercial PtC (20 wt.%)	75	0.43	32
PtCo/CX-1000	30	2.67	80
PtCo/CX-1250	41	1.92	79
PtCo/CX-1400	31	2.58	81

ECSCA: Electrochemically active surface area; SA: specific activity; MA: mass activity

## CONCLUSIONS

- Hollow PtCo nanoparticles supported on carbon xerogel were synthesized via a sacrificial templating method approach.
- Metal loading (TGA), pore size (Hg porosimetry), alloy composition (ICP-AES), and hollow structure with alloy formation (TEM, HAADF-STEM-EDX, XRD) were confirmed, demonstrating the successful synthesis of hollow PtCo catalysts with promising structural and compositional properties.
- The initial performance of hollow PtCo/CX catalysts were evaluated using electrochemical techniques such as CO stripping and ORR measurements on Rotating Disk Electrode.
- They exhibit a relatively small electroactive specific surface area (ECSCA: 30 – 41  $m^2/g_{Pt}$ ) due to the large diameter of the hollow particles (46–56 nm). However, they show high specific activity (1.9 – 2.7  $A/m^2_{Pt}$ ) and mass activity (79 – 81  $A/g_{Pt}$ ), measured at 0.9 V vs. RHE in 0.1 M  $HClO_4$  electrolyte.
- Further electrochemical assessment, including Accelerated Stress Tests (ASTs) in Rotating Disk Electrode (RDE) and full Membrane-Electrode Assembly (MEA) configurations, is planned for the next phase of this study.

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