

Hydrogen Fuel Cell Technology

Advancing Mobility for Better Air Quality



CSIR-CECRI has developed and demonstrated indigenous fuel-cell technologies spanning materials, membrane-electrode assemblies, stacks and integrated fuel-cell systems. The technology portfolio covers low-temperature PEM (LT-PEM), open cathode fuel cell, high-temperature PEM (HT-PEM) and direct methanol fuel cells, with demonstrations extending from portable power to automotive and marine applications.

Technology Platform (From laboratory scale to higher-TRL)

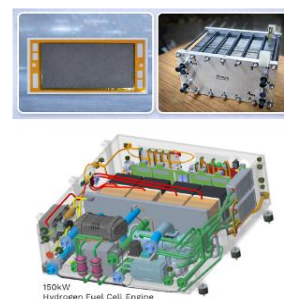
Electrocatalyst		
Properties	CECRI	State of Art
Pt loading (wt%)	20 - 60	40
Pt particle size (nm)	3 ± 0.5	3.5 ± 0.5
Crystallite size (nm)	2.0 ± 0.5	2.5 ± 0.5
ECSA (m ² g ⁻¹ Pt)	80 ± 5	60 ± 5
Mass activity (A mg ⁻¹ Pt)	0.3 ± 0.1	0.3

- Batch process scalable to 25 gm
- Indigenous production supply chain

Polymer Electrolyte Membrane (PEM)		
Properties	CECRI	State of Art
Thickness (μm)	20 ± 1	20 ± 1
Tensile Strength (MPa)	18.6	12.1
Elongation at Break (%)	190	120
Ion exchange Capacity (meq/gm)	1.30	1.25
Water Uptake (%)	57.6	55.2
Conductivity (mS/cm) @ 100% RH	190	100

- Batch process scalable to Roll to Roll casting
- Possible thickness from 15 - 100 μm
- Use: Fuel Cells, Electrolyzers

Fuel Cell Stack & Engine



- LT-PEM Fuel Cell up to 20 kW
- Open Cathode FC up to 5 kW
- Direct Methanol FC up to 0.5 kW
- Complete system integration

Engineering & Characterization Capabilities

- **Coating:** Bar, Spray, Slot Die
- **MEA Fabrication:** up to 400 cm²
- **FC testing:** Single Cell to 20 kW
- **Characterization:** XRD, TGA, BET, UV-VIS, FT-IR, UTM, Raman, IC, FESEM, XRF, Rheology
- **Software:** 3D Design, COMSOL, Ansys

Technology Demonstration Journey

(Indigenous Fuel Cell Technology from Materials to Mobility Demonstration)



What We Offer

Scale-up & Manufacturing Indigenous production supply chain for Electrocatalyst, Membrane, MEAs; Scalable Batch processes	Testing & Engineering Fuel-cell Engineering and testing from single cell to 20 kW; Characterization facilities; Software Support	Technology Translation Public–Private Partnership mode to develop higher TRL and MRL; Technology licensing (Exclusive and Non-exclusive); Consultancy Service.
---	--	--