

# What is a Solid Acid Fuel Cell?

It's a rugged, efficient, electrical generator which operates on a wide range of fuel sources.

A fuel cell is a device that silently generates electricity from hydrogen rich fuels, through a clean electrochemical reaction rather than dirty combustion.

There are five main types of fuel cells. The chemical composition of the electrolyte differentiates one fuel cell technology from another. SAFCeLL's technology is based on a new class of electrolytes called solid acids. Different electrolytes transport ions with varying efficiencies as a function of temperature, so that each of these types operates in a different temperature range.

Fuel Cell Type	Temperature	Electrolyte
SAFC - Solid Acid	200-300 °C	Solid acids, e.g. CsHSO <sub>4</sub>
PEMFC - Polymer Electrolyte Membrane	20-120 °C	Sulfonated polymers, e.g. Nafion®
AFC - Alkaline	100-200 °C	Aqueous KOH
PAFC - Phosphoric acid	150-200 °C	H <sub>3</sub> PO <sub>4</sub>
MCFC - Molten carbonate	600-700 °C	(NA,K)2CO <sub>3</sub>
SOFC - Solid oxide	700-1000 °C	(Zr,Y)O <sub>2-3</sub>

Solid acids are chemical intermediates between normal salts and normal acids. When a normal acid, such as phosphoric acid reacts with a normal salt, such as cesium carbonate, you end up with cesium dihydrogen phosphate – the current electrolyte in solid acid fuel cells.

At low temperatures, solid acids have ordered structures. However, at warm temperatures, certain solid acids undergo transitions to highly disordered "superprotonic" structures which causes the conductivity to increase dramatically.

Operating at mid-range temperatures around 250 °C, SAFCeLL's stacks tolerate impurities that pose obstacles for other fuel cell technologies, while still using inexpensive metal components and flexible polymer seals. This unique combination of properties results in a rugged and low cost stack platform that operates easily on commercially available fuels.

## About SAFCeLL

SAFCeLL develops solid acid fuel cell stacks for applications requiring tens of watts to tens of kilowatts. Formed in 2009, SAFCeLL is now developing clean, efficient power solutions for military & commercial applications.

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