Effect of Sulfur on SOFC Performance Using Diesel Reformate

R. Kerr

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Sulfur Poisoning Effect on SOFC APU System Power

- US ULSD contains up to 15 ppmw sulfur
- Max sulfur equates to 1.6 ppmv sulfur in APU testing
Single Cell on Reformate and Sulfur Poisoned Reformate

Stack Behavior in Unpoisoned Reformate

Stack Behavior in Reformate and 1.6 ppmv H$_2$S

At high fuel utilization, the effect of sulfur is significantly more pronounced in CO-containing diesel reformate than in hydrogen-only fuel.
EIS of Single Cells Using Poisoned and Un-poisoned Fuels

Sulfur affects the water-gas shift reaction to limit the ability to utilize the CO fraction of the reformate

\[ CO + H_2O \rightleftharpoons H_2 + CO_2 \]

Water Gas Shift Reaction
The performance decrease from sulfur has been measured on a stack at as low as 25 ppbv.