CH692 in class w3d2

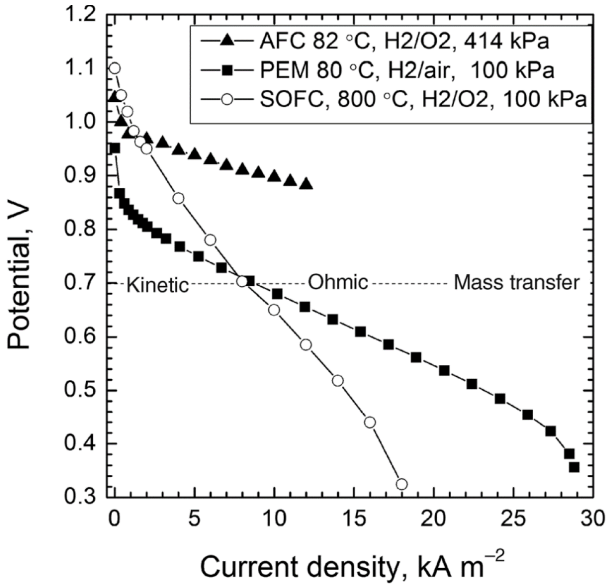


Figure 9.3 Example polarization curves for PEM, AFC, and SOFC.

Consider Figure 9.3:

(1) Sketch a diagram showing the major components of an PEM, AFC, and SOFC fuel cell. Highlight the key differences in each technology.

(2) Explain the shape of each curve. What physical models that you learned from fundamental electrochemistry can be applied to describe the shape of the polarization regime for different current densities?

(3) Why do the shapes of the curves for the different technologies look different? Make sure to provide a fundamental physical description in your explanation.

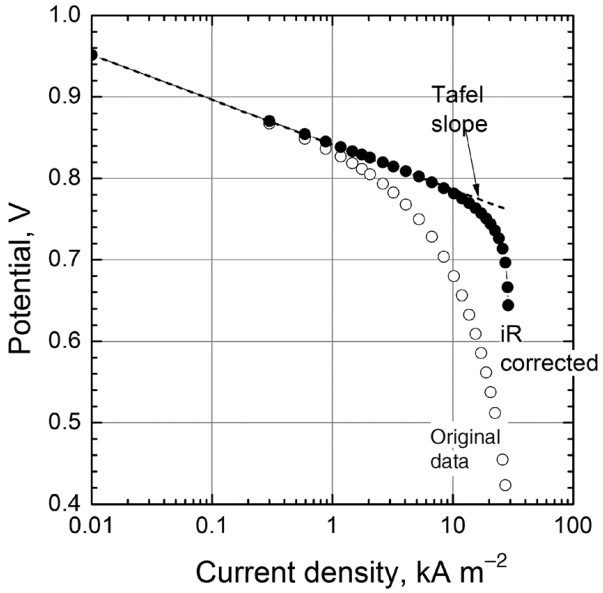


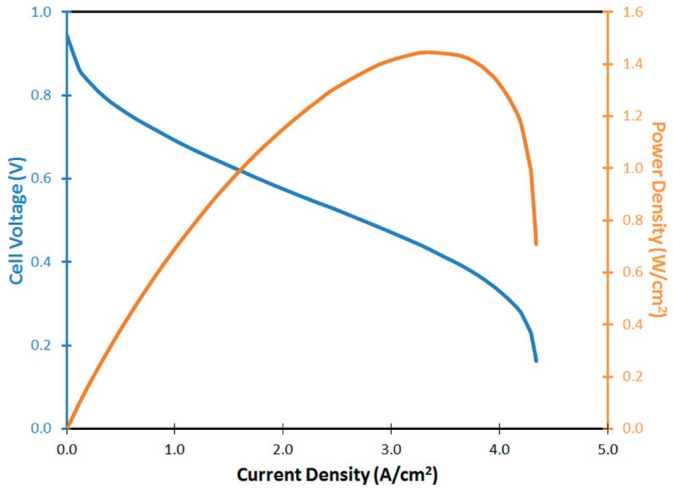
Figure 9.5 Tafel plot used for low-temperature PEM fuel cell from Figure 9.3.

Consider Figure 9.5:

(4) Across the hydrogen fuel cell systems discussed, Fuller and Harb focus on the kinetics of the ORR. Why is this? What other reactions are occurring in the cell? Why aren't these discussed?

(5) Explain why the pressure of the input reactant gas effects the kinetic overpotentials in a fuel cell.

(6) How does the concept of limiting currents you learned from Bard and Faulkner apply to fuel cells?



ACS Catalysis

Catalytic Advantages, Challenges, and Priorities in Alkaline Membrane Fuel Cells

Horie Adabi Firouzjaie and William E. Mustain*

Polarization and power curves for a 5 cm^2 active area AEMFC operating at 65 °C with a Fe–N–C cathode (0.9 mg/cm^2) and PtRu/C (0.6 mg_{PtRu}/cm^2) anode. The cell was operated with UHP H_2 and O_2 reacting gases flowing at 1.0 L/min. The anode and cathode reacting gas dew points were 55 and 60 °C, respectively.

7) What is the fuel cell efficiency for the data from Sustain at the maximum power point for the AFC?