Electrochemical performance of H_2O-CO_2 co-electrolysis with a tubular solid-oxide co-electrolysis (SOC) cell

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The H_2O-CO_2 electrochemical conversion process in solid-oxide co-electrolysis (SOC) cells may be one of the most efficient ways to reduce CO_2 emissions and to store renewable power simultaneously. In this study, a tubular solid-oxide co-electrolysis (SOC) cell based on a general electrode support solid-oxide fuel cell was fabricated and investigated. For this purpose, we fabricated tubular electrode support tubes through an extrusion process, and after which the essential SOC cell components, i.e., the electrolyte and the electrode, were coated onto the surface of the ceramic support consecutively using a vacuum slurry and dip-coating method. The cell was operated while varying the operating temperature, cathode gas flow rate, and the supplied amount of H_2O. The results demonstrate that the fabricated tubular SOC cell is a promising candidate for many practical applications, such as technology to mitigate climate change and power fluctuations associated with renewable energy.

Key words : SOC, CO_2, H_2O