

Effect of graphitized carbon on mesoporous layer for unitized regenerative fuel cell system

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High crystallinity of graphitized-carbon (Gr-carbon) was prepared and fabricated as a mesoporous layer (MPL) for unitized regenerative fuel cells (URFC) system to improve the stability and electrochemical performances. The crystalline properties of graphitized and amorphous carbon was confirmed by the XRD analysis. CV analysis revealed that the rate of oxidation with the Am-carbon electrode is significantly higher than with the Gr-carbon electrode. The carbon corrosion resistance is considerably higher to the Gr-carbon than the amorphous-carbon (Am-carbon). The round-trip energy conversion efficiencies (ϵ_{RT}) are 36.6, 41.8, and 43.8 % at the current density of 1 A cm⁻² for non-MPL, typical Am-carbon MPL and Gr-carbon MPL, respectively. In addition, Gr-carbon shows a higher ϵ_{RT} performance even after 20th cycles (42.3%), which is mainly due to enhanced electrical conductivity, higher stability and high crystallinity of Gr-carbon after thermal treatment. Based on the results, it can be conclude that the Gr-carbon significantly improved the ORR/OER performances and stability (prevent the surface oxidation and carbon corrosion) during the long term operation in the URFC system.