Boosting Electrochemical CO_2 Reduction on N-doped Carbon Nanowebs with Sulfur Engineering

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Electrocatalytic CO_2 reduction becomes more attractive for reducing CO_2 emission and converting it into useful chemicals, but it suffers from high overpotential, low efficiency or poor product selectivity. In this study, N,S dual-doped carbon nanoweb (NSCNW) catalysts is proposed as an efficient nonmetallic electrocatalyst for CO_2 reduction. It preferentially and rapidly converted CO_2 to CO with a high CO Faradaic efficiency of 93.4 % and exhibited an excellent durability in performance attenuation toward CO formation. Its superior performance can be attributed to the structure advantages and synergistic effect between N and S atoms, exhibiting that the 3D nanoweb structures with the highest ratio of thiophene S and oxidized S synergistically lead to the significant enhancement in converting CO_2 to CO. Our results should be of great significance and interest to give a new approach in the research field of CO_2 electroreduction which requires a guideline for the rational design and accurate modulation of carbon-based electrocatalysts.