Layer Number-Controlled Fe-N/C Catalysts Reveal Unexpected ORR Activity Trend

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Iron and nitrogen-doped carbon (Fe-N/C) catalysts are considered the most promising alternative to Pt-based catalysts due to their excellent oxygen reduction reaction (ORR) activity. We have developed a systematic, solid-state catalyst synthesis route to layer number-controlled Fe-N/C catalysts. As the amount of precursor increased, the framework structure of Fe-N/C catalysts changed from tube to rod. The tubular catalyst exhibited a much larger CO adsorption than the rod structure catalyst, indicating that the tubular catalyst has a higher utilization of active sites. Surprisingly, the ORR activity of the rod structure catalyst was significantly higher than that of the tubular catalyst, and the turnover frequency value of the rod structure catalyst was 30 times greater than that of the tubular catalyst. We suppose that the unexpected ORR activity trend is due to differences in the O_2 binding form of catalysts with different structures.