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# Oxygen Reduction Activity of Molybdenum Nitride for Cathode Catalyst of Polymer Electrolyte Fuel Cells

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Aiming to suppress global warming, Japan has set a goal of reducing $CO_2$ emissions to zero by 2050. In order to achieve this goal, production of hydrogen from renewable energy by water electrolysis and obtaining electrical energy from fuel cells is regarded as an important system. Although polymer electrolyte fuel cell (PEFC) systems has already commercialized for home and fuel cell vehicles, their high cost due to the use of Pt as electrode catalysts has hindered their widespread use. Therefore, in this study, we synthesized molybdenum nitride and investigated the oxygen reduction activity with the aim of developing a Pt-free cathode catalyst. First, molybdenum nitride was obtained by calcining molybdenum sulfide under $NH_3$ flow. As a result, $Mo_5O_6$ obtained by calcination at 750° C showed the highest oxygen reduction activity. Next, $(NH_4)_6Mo_7O_{24}{\cdot}4H_2O$ which contains nitrogen was calcined under $NH_3$ flow to prepare molybdenum nitride. Then, MoN calcined at 800° C showed higher oxygen reduction activity than any molybdenum nitride. Since Mo is much cheaper than Pt, Mo nitrides made from $(NH_4)_6Mo_7O_{24}{\cdot}4H_2O$ are considered to be useful as cathode catalysts for fuel cells.

***Keywords*** : PEFC, Cathode, Oxygen reduction reaction, Molybdenum nitride, Crystallite size