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Abstract: The development of high temperature proton exchange membranes (HT-PEMs) with high proton conduction and excellent mechanical properties remains a challenge. Herein, the graphitic carbon nitride (CN) nanosheets were successfully introduced into poly(ether sulfones)-poly(vinyl pyrrolidone) polymer matrix to prepare composite membrane through a facile blending method. The synthesized CN nanosheets were characterized by scanning electron microscope (SEM), Transmission electron microscopy (TEM), Raman spectrum, and X-ray photoelectron spectroscopy (XPS). The proton conductivity of the composite membrane was improved up to 36% (0.104 S cm^{-1}) after incorporating CN nanosheets at 160 ^{o}C, due to increased PA doping level and faster proton dissociation. Meanwhile, the tensile strength of the composite membrane is increased of 60% (6.0 MPa) compared to that of pristine membrane, because of the physical reinforced effect from the 2D structure of CN. Furthermore, the single cell fabricated with the optimized membrane exhibits a peak power density of 512 mW cm^{-2} at the temperature of 160 ^{o}C for 200 h with no obvious loss of current density.

Keywords: Graphitic carbon nitride, High temperature proton exchange membrane, PA doping level, Proton conduction, Mechanical property.