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Abstract: The proton conductivity at the interface of Nafion and sulfonated polypyrrolone composite membrane decreases by 56% from 0.039 Scm^{-1} to 0.017 Scm^{-1}, due to phase separation after annealing this binary composite membrane at 140 °C, which is 10 °C above the glass transition temperature of Nafion polymer. After annealing the membrane, the change in the relative intensity of the lower angles of the X-ray diffraction (XRD) peaks located at ca. 11.9°, 17.5 ° and 19.7 ° indicates an increase of the low spacing region for the polymer chains of the composite membrane and atomic force microscopy (AFM) measurement depicts a morphological evolution from an uniform dispersion to a spherules