Study and development of kraton/graphene composite membrane based ionic polymer metal composite (IPMC) actuator for robotics application

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Material	Ion exchange capacity (meq g ⁻¹ of dry membrane)	Proton conductivity (σ) (mS/cm)
KR-GR-Pt	2.2	19

In this study fabrication of kraton (KR)/graphene (GR) composite polymer based ionic polymer metal composite (IPMC) membrane actuator with Pt metal as electrodes was carried out for micro robotics application (Figure 1) [1-4]. To examine the suitability of fabricated IPMC ion exchange capacity (IEC), water uptake, proton conductivity, water loss, cyclic voltammetry (CV), linear sweep voltammetry (LSV) [3], Fourier transform infrared spectroscopy (FTIR), thermal stability, and tip displacement studies are performed.

Table 1: Ion exchange capacity and proton conductivity of the KR-GR-Pt membrane actuator

The water holding capacity of kraton-graphene (KR-GR) membrane was found to be 153 %, at

45 °C within 10 h of immersion time. The IEC and proton conductivity of the KR-GR-Pt IPMC membrane was found to be 2.2 meq g⁻¹ of dry membrane and 1.9×10⁻² S cm⁻¹ respectively (Table 1). Maximum water loss was achieved as 44 % at 5 V for a time period of 16 min. By developing a multi KR-GR-Pt ionic fingers based gripper, it was demonstrated that this actuator has potential in industrial application.

References

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Figure 1: A prototype of multi KR-GR-Pt ionic fingers based gripping system