Challenges to the Application of IPMC as a Surface Wiper

Challenge	Solution
Fluorinate base - difficult to bond	Pre-etching (LaRC)
Sensitive to dehydration (~5-min)	Etching and coating (NASA-LaRC)
Electroding points cause leakage	Effective compact electroding method was developed
Off-axis bending actuation	Use of load (e.g., wiper) to constrain the free end
Most bending occurs near the poles	Improve the metal layer uniformity
Electrolysis occurs at >1.23-V in Na+/Pt	• Minimize voltage • Use IPMC with gold electrodes and cations based on – Li^+ – Perfluorocarboxylate with tetra-n-butylammonium (ONRI)
• Survive -155°C to +125°C • Operate at -125°C to + 60°C	IPMC was demonstrated to operate at -140°C
Need to remove a spectrum of dust sizes in the range of >3μm	• Use effective wiper-blade design (ESLI, San Diego, CA) • Apply high bias voltage to repel the dust
Reverse bending under DC voltage	Limit application to dynamic/controlled operations
Developed coating is permeable	• Alternative polymeric coating • Metallic Self-Assembled Monolayer overcoat
Residual deformation	Still a challenge
No established quality assurance	• Use short beam/film • Efforts are underway to tackle the critical issues