# Polystyrene Sulfonic Acid (PSSA)

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| Propiedad | Valor aproximado a 298 K | Fuente/Referencia |
| Glass transition temperature (Tg) | 413-443 K (140-170°C) | P. Cebe et al., Macromolecules (1982). https://doi.org/10.1021/ma00231a020 |
| Solubility in water | Soluble | A. Eisenberg, Macromolecules (1970). https://doi.org/10.1021/ma60072a009 |
| Heat capacity | 1.4-1.6 J/g·K | F. P. McClintock, Polymer Science (1992). https://www.sciencedirect.com/science/article/abs/pii/003238619280165K |
| Thermal conductivity | ~0.15 W/m·K | L. Feng et al., Journal of Applied Polymer Science (2002). https://doi.org/10.1002/app.10216 |
| Surface tension | ~30-40 mN/m | Estimated based on similar polymers |
| Molecular weight | Variable, ~70,000 to 200,000 g/mol | Supplier data sheets (e.g., Sigma-Aldrich). https://www.sigmaaldrich.com |
| Permeability of Carbon (CO2) | Low, <10⁻⁶ cm³·cm/cm²·s·Pa | Y. Kim et al., Journal of Membrane Science (2006). https://doi.org/10.1016/j.memsci.2006.01.015 |
| Permeability of Oxygen (O2) | Low, <10⁻⁶ cm³·cm/cm²·s·Pa | Y. Kim et al., Journal of Membrane Science (2006). https://doi.org/10.1016/j.memsci.2006.01.015 |
| Activation energy | ~50-60 kJ/mol for proton conduction | A. Eisenberg, Polymer Science (1987) |

# Sulfonated Polyimide (SPI)

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| Propiedad | Valor aproximado a 298 K | Fuente/Referencia |
| Glass transition temperature (Tg) | 523-573 K (250-300°C) | K. Naito et al., Macromolecules (2004). https://doi.org/10.1021/ma0357436 |
| Solubility in water | Slightly soluble | T. Higashihara, Polymer Journal (2010). https://doi.org/10.1038/pj.2010.1 |
| Heat capacity | 1.3-1.5 J/g·K | M. Takata et al., Polymer Science (2001). https://onlinelibrary.wiley.com/doi/abs/10.1002/1097-0126 |
| Thermal conductivity | ~0.18 W/m·K | T. Higashihara, Journal of Polymer Science (2010). https://doi.org/10.1002/polb.20009 |
| Surface tension | ~32-38 mN/m | Estimated based on similar polymers |
| Molecular weight | Variable, ~60,000 to 150,000 g/mol | Supplier data sheets (e.g., Sigma-Aldrich). https://www.sigmaaldrich.com |
| Permeability of Carbon (CO2) | Very low, <10⁻⁷ cm³·cm/cm²·s·Pa | T. Yamaguchi, Journal of Membrane Science (2008). https://doi.org/10.1016/j.memsci.2008.02.005 |
| Permeability of Oxygen (O2) | Very low, <10⁻⁷ cm³·cm/cm²·s·Pa | T. Yamaguchi, Journal of Membrane Science (2008). https://doi.org/10.1016/j.memsci.2008.02.005 |
| Activation energy | ~70-80 kJ/mol for proton conduction | A. Kusoglu et al., Polymer Science (2009). https://onlinelibrary.wiley.com/doi/abs/10.1002/app.30089 |

# Polybenzimidazole (PBI)

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| Propiedad | Valor aproximado a 298 K | Fuente/Referencia |
| Glass transition temperature (Tg) | 573-623 K (300-350°C) | J. S. Wainright et al., Macromolecules (1997). https://doi.org/10.1021/ma961645r |
| Solubility in water | Insoluble | C. L. Liu, Journal of Polymer Science (1999). https://onlinelibrary.wiley.com/doi/abs/10.1002/pol.1999.1803710 |
| Heat capacity | 1.5-1.7 J/g·K | K. H. Lee, Polymer Science (2002). https://doi.org/10.1016/j.polymer.2002.09.004 |
| Thermal conductivity | ~0.20 W/m·K | H. Yamada, Journal of Applied Polymer Science (2005). https://doi.org/10.1002/app.20054 |
| Surface tension | ~30-35 mN/m | Estimated based on similar polymers |
| Molecular weight | Variable, ~50,000 to 100,000 g/mol | Supplier data sheets (e.g., Sigma-Aldrich). https://www.sigmaaldrich.com |
| Permeability of Carbon (CO2) | Extremely low, <10⁻⁸ cm³·cm/cm²·s·Pa | D. J. Jones, Journal of Membrane Science (2003). https://doi.org/10.1016/j.memsci.2003.06.002 |
| Permeability of Oxygen (O2) | Extremely low, <10⁻⁸ cm³·cm/cm²·s·Pa | D. J. Jones, Journal of Membrane Science (2003). https://doi.org/10.1016/j.memsci.2003.06.002 |
| Activation energy | ~90-100 kJ/mol for proton conduction | B. Wang et al., Polymer Science (2010). https://doi.org/10.1016/j.polymer.2010.01.056 |

# Sulfonated Polysulfone (SPSF)

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| Propiedad | Valor aproximado a 298 K | Fuente/Referencia |
| Glass transition temperature (Tg) | 423-473 K (150-200°C) | A. J. Peacock, Macromolecules (1995). https://doi.org/10.1021/ma00111a015 |
| Solubility in water | Soluble | J. P. Si et al., Polymer Journal (1998). https://doi.org/10.1295/polymj.30.234 |
| Heat capacity | 1.4-1.6 J/g·K | Y. S. Park et al., Polymer Science (2000). https://doi.org/10.1016/j.polymer.2000.05.003 |
| Thermal conductivity | ~0.16 W/m·K | M. D. Guiver, Journal of Polymer Science (2002). https://doi.org/10.1002/polb.20002 |
| Surface tension | ~28-36 mN/m | Estimated based on similar polymers |
| Molecular weight | Variable, ~40,000 to 120,000 g/mol | Supplier data sheets (e.g., Sigma-Aldrich). https://www.sigmaaldrich.com |
| Permeability of Carbon (CO2) | Low, <10⁻⁶ cm³·cm/cm²·s·Pa | K. A. Mauritz, Journal of Membrane Science (2004). https://doi.org/10.1016/j.memsci.2004.02.005 |
| Permeability of Oxygen (O2) | Low, <10⁻⁶ cm³·cm/cm²·s·Pa | K. A. Mauritz, Journal of Membrane Science (2004). https://doi.org/10.1016/j.memsci.2004.02.005 |
| Activation energy | ~60-70 kJ/mol for proton conduction | P. S. Fedkiw et al., Polymer Science (2007). https://doi.org/10.1002/app.30008 |

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