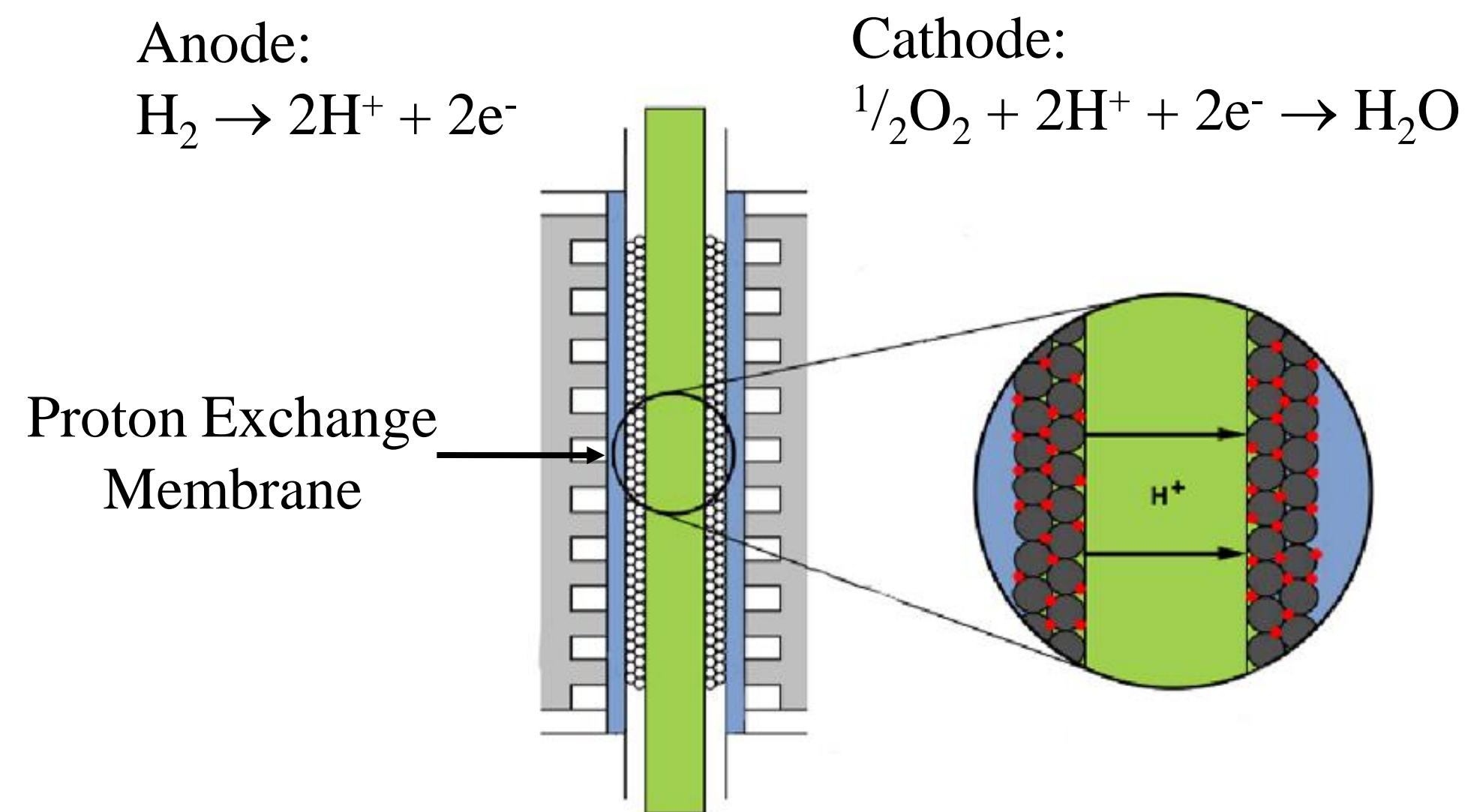




Fuel Cell Membranes

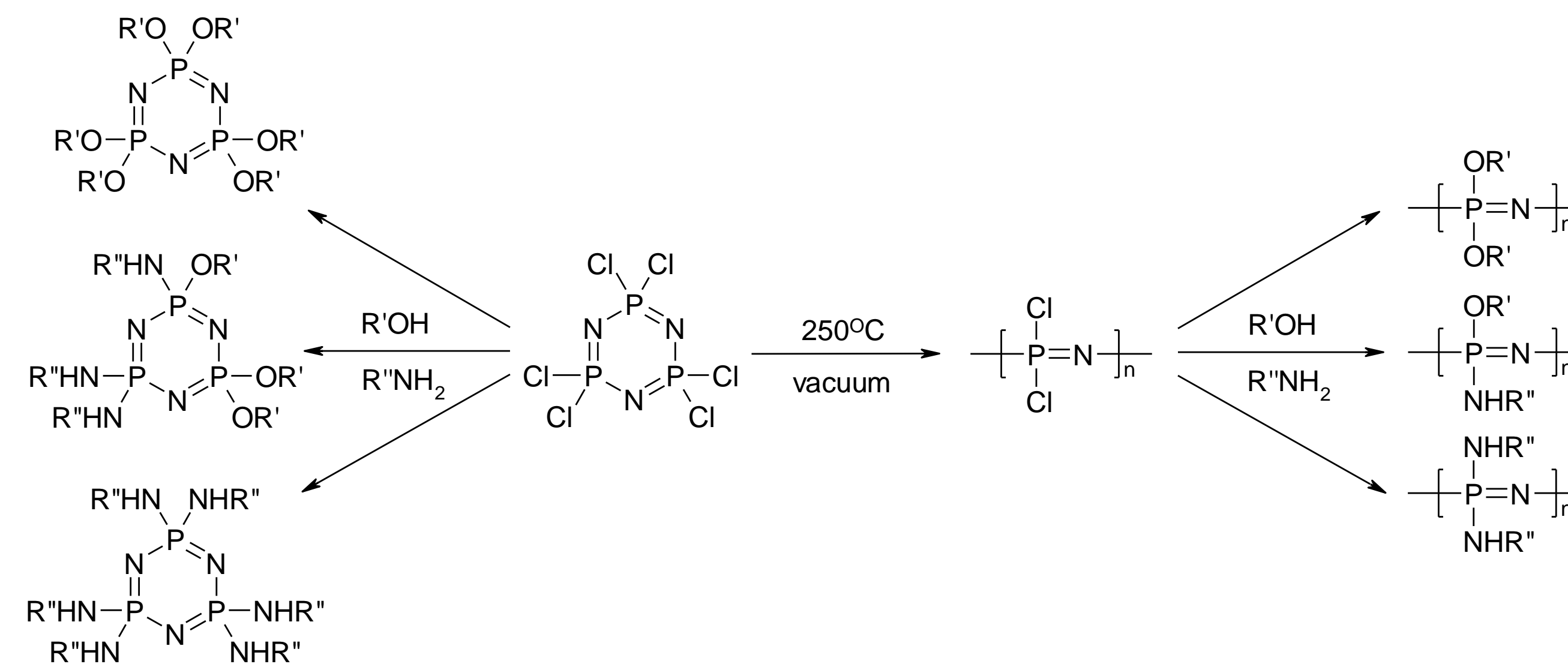


Adapted from: The Polymer Electrolyte Fuel Cell
<http://www.education.lanl.gov/resources/h2/gottesfeld/education.html>

PEM Requirements

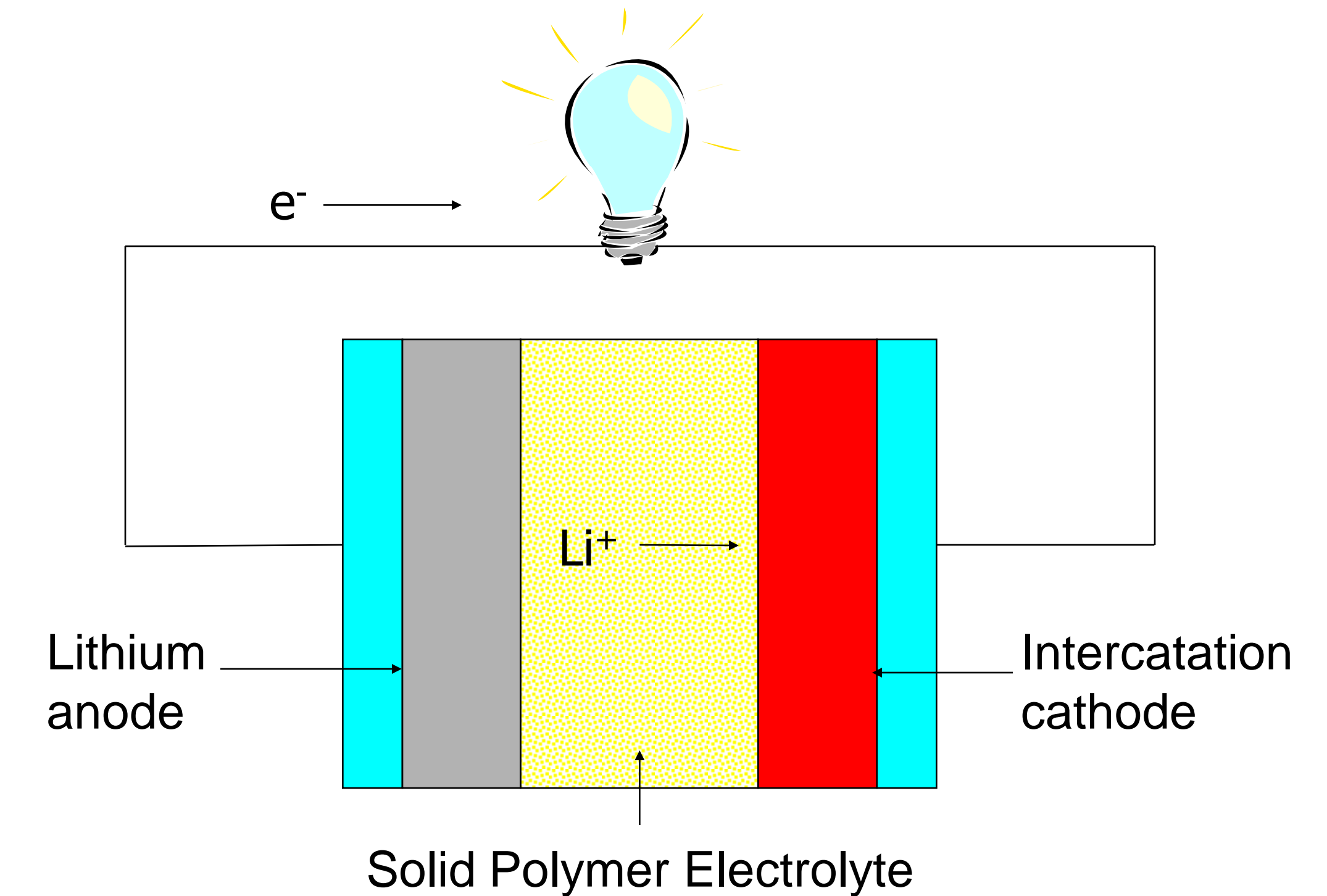
- Mechanical, Thermal and Chemical Stability
- Compatibility with catalyst
- Impermeable to oxygen and hydrogen
- Good water swelling properties
- High proton conductivity > 0.01 S/cm

The Chemistry of Phosphazenes



Phosphazenes are a versatile class of compounds with many potential applications. The advantage of phosphazenes lies in the tailorability of the side groups to the backbone to obtain the desired properties. To date, more than **700** phosphazenes have been synthesized.

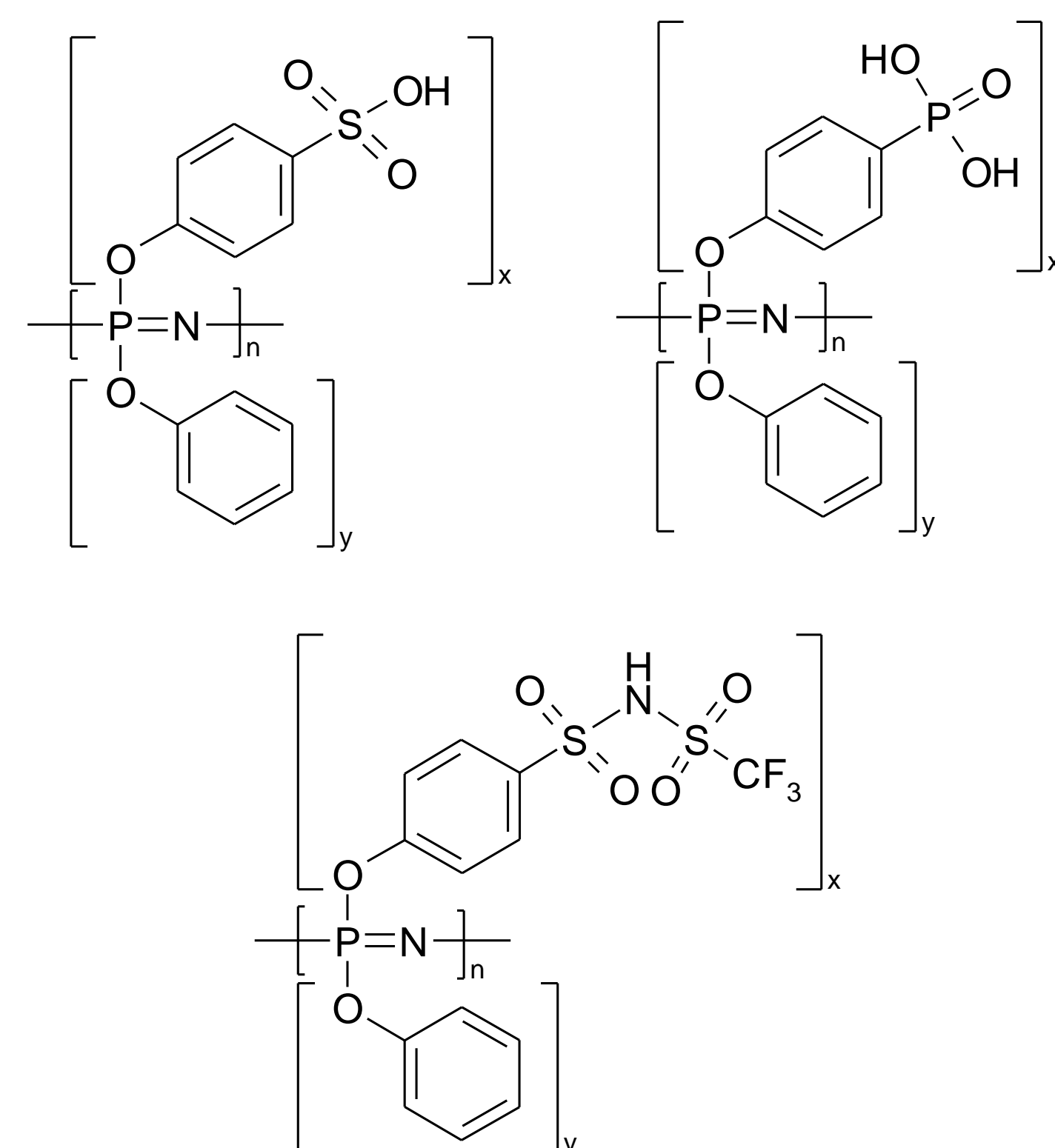
Solid Polymer Electrolytes



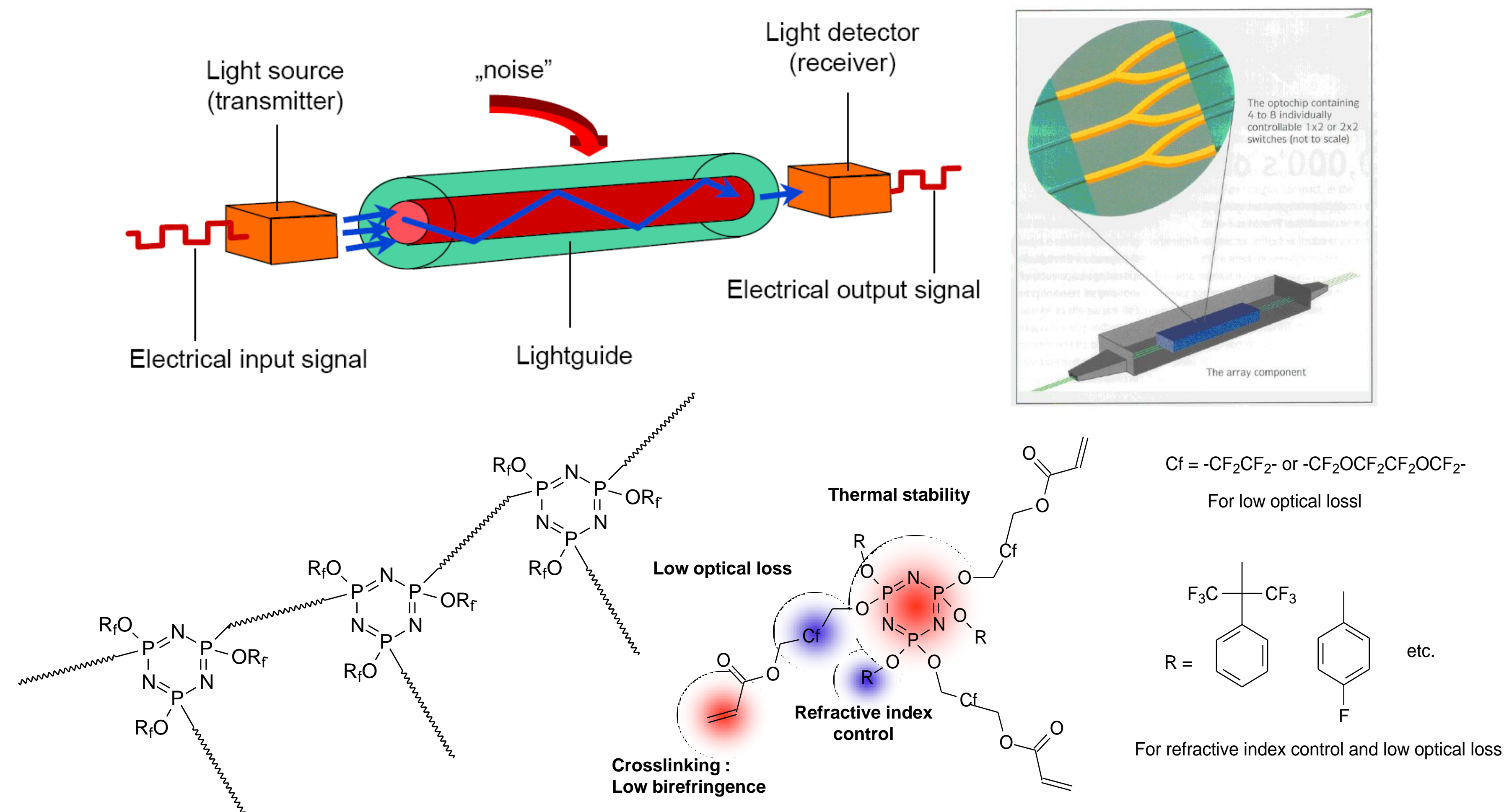
SPE Requirements

- Mechanical and chemical stability
- Ability to dissolve salts
- Amorphous at room temperature
- Low glass transition temperature
- High cation conductivity > 10^{-3} S/cm

Phosphazene PEM Architectures



Optical Materials



Phosphazene SPE Architectures

