

**Thermal stability study of polymers for electrolytes membrane fuel cells**

**INTRODUCTION**

High temperature fuel cell technology has a high efficiency for energy conversion. Since it operates at high temperatures, the thermal stability of the various components is crucial to ensure the performance of the fuel cell throughout its lifetime.

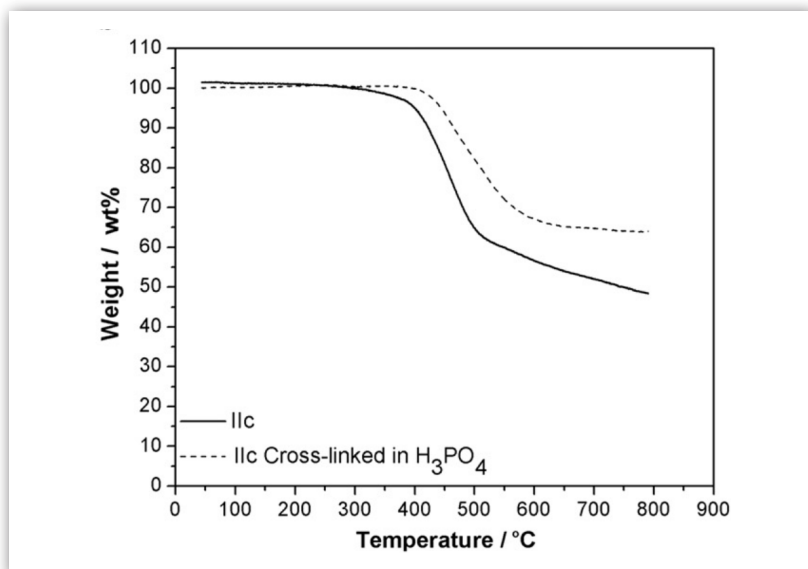
Thermogravimetric analysis is used to study the thermal stability of these components such as electrolyte membranes.

**EXPERIMENT**

THEMYS ONE TGA was used with cross-linked polymer electrolyte membranes for high temperature fuel cells. The effect of crosslinking on the membrane’s thermal stability was studied.

The virgin and cross-linked sample polymer was analyzed with the following thermal profile:

- Heating from 30°C to 800°C at 10°C/min
- Atmosphere: nitrogen



**RESULTS AND CONCLUSION**

The virgin polymer is stable up to 280°C. At higher temperature, decomposition of the material can be observed on the TGA analysis result.

The TGA analysis of the crosslinked polymer shows an increase of the thermal stability: the decomposition temperature is 405°C, which is an improvement of 125°C.

These results highlighted that the crosslinking significantly improved the thermal properties of the membrane and extended its operational stability in a high temperature fuel cell system.

*Papadimitriou, Konstantinia & Geormezi, Maria & Neophytides, Stylianos & Kallitsis, Joannis. (2013). Covalent cross-linking in phosphoric acid of pyridine based aromatic polyethers bearing side double bonds for use in high temperature polymer electrolyte membrane fuelcells. Journal of Membrane Science. 433. 1–9. 10.1016/j.memsci.2012.12.051.*

**INSTRUMENT**

**THEMYS ONE**



- **HIGH SENSITIVITY BALANCE FOR THE DETECTION OF SMALL MASS VARIATIONS** specifically designed for TGA analysis.
- **CONVENIENCE OF ONE FURNACE** to reach temperatures as high as **1150°C or 1600°C**.
- **PLUG AND PLAY INTERCHANGEABLE RODS** to perform TGA only, TG-DSC, TG-DTA, and 3D high sensitivity/Cp measurements.
- **EXTERNAL COUPLING CAPABILITY** including evolved gas analysers