Technische Universität Graz
Institut für Chemische Verfahrenstechnik und Umwelttechnik
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☐ Bachelor's thesis
☒ Master's thesis

☒ theoretical
☒ experimental
☐ constructive

Determination of fluoride in Polymer Electrolyte Membrane Fuel Cell (PEMFC) effluent water

Perfluorosulfonic acid (PFSA) polymer electrolyte membranes are known for their thermal and chemical stability. However, under fuel cell operating conditions, chemical degradation can occur.
The break-down of the membrane can be correlated with the fluoride, and fluoride species emission during operation, which can then be measured with different approaches including ion chromatography [1] and optical spectroscopy [2].

The aim of this thesis is the **measurement of fluoride in PEMFC effluent water** to help **quantify degradation mechanisms**. This will include the following tasks:

- Method development and validation
- Sampling and sample preparation
- Working with chemical laboratory equipment, optical spectrometry, and HPLC (High-performance liquid chromatography)

In the Fuel Cell & Hydrogen Working Group at CEET, you can become part of a team of experienced researchers, PhD students with expertise in materials preparation, electrochemistry and cell characterization, as well as other motivated master students. The research group has access to a fully equipped laboratory with the necessary infrastructure for the planned experimental work.

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[1] Yandrasits, M. A., Komlev, A., Kalstabakken, K., Kurkowski, M. J., & Lindell, M. J. (2021). Liquid Chromatography/Mass Spectrometry Analysis of Effluent Water from PFSA Membrane Fuel Cells Operated at OCV. *Journal of The Electrochemical Society*, *168*(2), 024517. https://doi.org/10.1149/1945-7111/ABE56A

[2] Haj-Hussein, A. T., & Al-Momani, I. F. (2006). Indirect Spectrophotometric Determination of Fluoride In Water With Zirconium-Spadns By Flow Injection Analysis. *Http://Dx.Doi.Org/10.1080/00032718908051622*, *22*(6), 1581–1599. https://doi.org/10.1080/00032718908051622