Contribution ID: **73** Type: **Zamestnanci fyzika**

Stability of acrylic acid grafted microporous polymeric membranes in alkaline electrolyte

Wednesday, November 26, 2025 3:33 PM (1 minute)

This work is devoted to development and characterization of inter-electrode separators for alkaline water electrolysis (WE) for hydrogen production. The purpose of the separator is to prevent mixing of the produced hydrogen and oxygen, therefore the separator must possess low permeability to these gases under WE conditions. Meanwhile, the separator must be highly conductive to OH- ions to minimize the energy losses. The separator must also possess mechanical strength and chemical stability in alkaline electrolyte.
In our previous work we have shown that separators produced by plasma-initiated graft polymerization of acrylic acid on microporous membranes possess high ionic conductivity and low permeability to hydrogen under WE conditions [1,2]. Nevertheless, the main weakness of this type of separators was insufficient durability in alkaline electrolyte, especially at elevated temperatures. In this work we show that durability of this type of separators can be significantly improved by optimization of conditions of the plasma activation as well as by addition of crosslinking agents during the graft-polymerization process. The improved separators exhibit high stability in 30 wt.% KOH electrolyte at 60℃ for at least 5000 hours.
[1] STAŇO Ľubomír, STANO Michal and ĎURINA Pavol. International Journal of Hydrogen Energy, 2020. Vol. 45, p. 80-93.
[2] KUŤKA Martin, STAŇO Ľubomír, KOVÁČIK Dušan, SATRAPINSKYY Leonid and STANO Michal. International Journal of Hydrogen Energy, 2024. Vol. 84, p. 224-234.

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Session Classification: Poster session + káva: prezentácie vedeckých výsledkov FMFI UK Zamestnanci Fyzika

Track Classification: Poster session + káva: prezentácie vedeckých výsledkov FMFI UK Zamestnanci: Poster session + káva: prezentácie vedeckých výsledkov FMFI UK Zamestnanci Fyzika