The Warsaw Doctoral School in Natural and Biomedical Sciences and the Institute of High Pressure Physics PAS cordially invite you to a **SPOTLIGHT TALK**

Advanced ceramic mixed ionic-electronic conductors for hydrogen purification

given by

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on 19th June 2024, 12:30

at the IHPP PAS New Technologies Building,
Al. Prymasa Tysiąclecia 98, seminar room, 2nd floor
Duration: 60+ min

and online via Zoom:

https://us02web.zoom.us/j/8352053896?omn=88340466043

All Warsaw-4-Phd students (and others) are very welcome!

Abstract:

Hydrogen separation and purification technology is a key element in the use of H2 as an energy carrier and in other important technological applications. Dense ceramic materials based on mixed ionic and electronic conductors (MIEC) are currently attracting growing interest for their potential application in H2 separation membranes or in catalytic membrane reactors at T > 600 °C. [1] Indeed, these membranes allow a selective non-galvanic separation by incorporating H2 in their crystal structure as charged protonic defects and electrons/holes that are transported to the opposite side of the membrane under an H2 partial pressure gradient, i.e. without any external energy. When used as membrane reactors, they also combine separation and reaction in a single unit, increasing efficiency.

In this context, ceramic-ceramic (cer-cer) composites have gained interest in the last 5 years due to their improved hydrogen permeability compared to single phase materials. Among these, dual-phase membranes based on ceria zirconate perovskites and doped ceria oxides have demonstrated remarkable performance as dense H2-separation membranes, with H2 flux values among the highest reported in the literature for this type of system. [2,3]
The seminar will provide a comprehensive overview of the use of proton conducting ceramic membranes for hydrogen separation, with particular emphasis on dual-phase ceramic membranes based on $BaCe_{0.65}Zr_{0.20}Y_{0.15}O_{3-\delta}$ (BCZ20Y15) perovskite and doped ceria ($Ce_{0.85}M_{0.15}O_{2-\delta}$ M = Y or Gd, YDC15 or GDC15) composites. The preparation methods, hydrogen permeability and chemical stability issues are also discussed.

References:

[1] H. Wang, Et al., J. Ind. Eng. Chem., 2018, 60, 297.
[2] E. Rebollo, Et al., Energy Environ. Sci., 2015, 8, 3675.
[3] D. Montaleone, Et al., J. Mater. Chem. A, 2018, 6, 15718.