

# Study on electrode of solid electrolyte hydrogen (isotope) sensor for application to liquid blankets.

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Molten salt LiF-BeF<sub>2</sub> (Flibe), molten lithium (Li), and molten lead-lithium (Pb-17Li) are candidate blanket tritium breeding materials for fusion reactors. For the blankets using those liquid breeders, control of tritium is the key issue. For this purpose, on-line sensing of tritium is an essential technology. Proton conductive solid electrode is the functional ceramic that can allow hydrogen to permeate selectively. The objective of the present study is to develop the monitoring system of hydrogen isotopes in liquid breeders using the solid electrodes. The platinum (Pt) electrode, that has been used conventionally, uses the electrode reaction in three-phase boundaries. However, this system is difficult to be used in highly corrosive environments because a contact of the solid electrodes with the atmosphere is necessary. In this study, therefore, a sensor in which the contact of the electrodes with the environment can be avoided is explored.

A fully coated electrode with palladium (Pd) or palladium-silver (Pd-Ag) is one of the candidates. In this study, fundamental investigation of this system is carried out.

Coating of CaZr<sub>0.9</sub>In<sub>0.1</sub>O<sub>3-a</sub> electrodes with Pd or Pd-Ag was carried out by painting followed by heat treatment in various conditions. The heat treatment of 1673K resulted in the formation of the coating with very low density of defects. The sensor using the coating showed good performance both in the atmosphere of argon-hydrogen mixed gas and molten salt Flinak at 873K.

The present study demonstrated feasibility of Pd or Pd-Ag coated CaZr<sub>0.9</sub>In<sub>0.1</sub>O<sub>3-a</sub> system as a hydrogen sensor for corrosive environments such as liquid breeders.

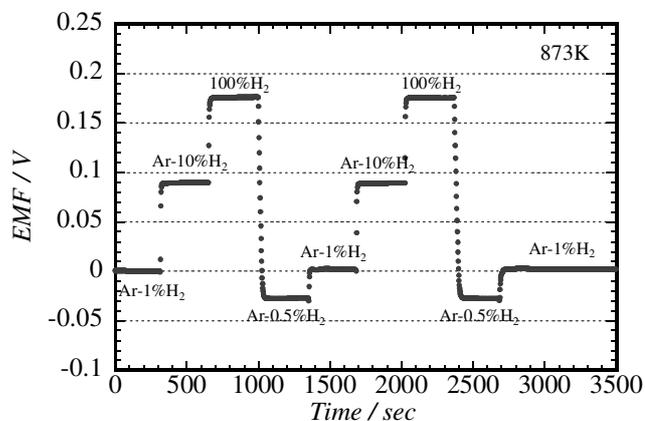


Fig. 1: The change of electro motive force (EMF) of Pd coated CaZr<sub>0.9</sub>In<sub>0.1</sub>O<sub>3-a</sub> hydrogen sensor with the change of composition of gaseous environments.