UNIVERSITI TEKNOLOGI MARA

POWDER PREPARATION EFFECT ON OXYGEN PERMEATION FLUXOF HOLLOW FIBRE LSCF6428 CERAMIC PEROVSKITE MEMBRANE

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AUTHOR'S DECLARATION

I declare that the work in this thesis/dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

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ABSTRACT

The industrial demand for pure oxygen had increased throughout the years. It is expected the market for this commodity will massively expand in the near future. However, the current industrial normal processes to produce pure oxygen from air have their limitations. Alternatively, oxygen production through separation from air using perovskite membrane particularly LSCF6428 compound has shown a potential to become a reliable and efficient process. Nevertheless, in order to achieve high oxygen permeation flux through the perovskite dense membrane, several factors must be taken into consideration. One of these factors is the powder preparation method, which determined the powder properties such as its particle size, particle shape and compound structure. The objective of this research is to observe the effect of powder preparation towards oxygen permeation flux through hollow fibre membrane. Therefore, in this research, 3 powder preparation methods; solid state reaction, reactive grinding and co-precipitation were applied to produce LSCF6428 perovksite powders. Through characterization process, the produced powders were compared with a commercially purchased powder. Afterward, by using 2 different LSCF6428 powders; powder derived from solid state reaction method and commercially procured powder, two types of hollow fibre ceramic membranes were fabricated using phase inversion/sintering technique. The membranes were characterized accordingly before it underwent oxygen permeation studies at several condition settings. Based from the results obtained, it was shown that both membranes were gas tight at ambient temperature and gave relatively the same oxygen permeation flux at several temperature values. Given that both membranes successfully achieved asymmetric structure, which provide small oxygen permeation resistance and large surface area for oxygen surface reaction, it was deem that the membrane structure and configuration in the shape of hollow fibre played a significant factor in determining the oxygen permeation flux as compared to powder preparation method. In conclusion, the powder preparation method does not directly affect the oxygen permeation flux through hollow fibre membrane.

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