Ultra-thin nickel dense membrane for hydrogen separation at high temperature

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Hydrogen supply can be derived from fossil fuel sources, for example by natural gas steam reforming and coal gasificiation. H2 selective membranes have been prepared as separation method since they can offer an efficient process. Among the membranes such as polymers, ceramics and metals, dense metal membranes, operating via a solution-diffusion mechanism, can produce pure H2 because of its dense structure which prevents the passage of other atoms and molecules, e.g. CO, CO2, O2, N2, CH4, H2O. Thus, the objective of this study is development of ultra-thin dense nickel membranes. Ultra-thin nickel layer was formed on porous nickel supports (PNS) by polishing method with sand-papers. The membrane preparation method was very simple and cost effective. The high mechanical strength of the nickel dense membrane could provide easy modulation with metal O-ring and flange-type metal module. The gas permeation tests using H2 and N2 could be carried out at high temperature (~700 ℃) because of its good thermal stability. The surface morphology and thickness of the membrane were characterized by SEM.