

References

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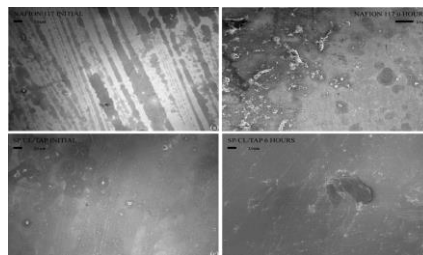


Figure 1: FESEM image for Nafion® (a) before and (b) after Fenton Reagent test. Image (c) and (d) is the FESEM image of SP/CL/TAP membrane before and after Fenton Reagent test, respectively

DO 15

Characterization of SOFC cermet anode powders synthesized by microwave-assisted glycine nitrate combustion process (MW-GNP) technique

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Ni-based solid oxide fuel cell (SOFC) cermet anode powders have been prepared by a simple and inexpensive method, namely microwave-assisted glycine nitrate combustion process (GNP) technique. Scandium oxide, nitric acid and selected metal (Ni, Fe, Cu, Co, Ce, Zr) nitrates were used as raw materials and reacted with glycine as a reducing agent to synthesis cermet anode consisting of 50 vol% bimetallic (25 vol% Ni-25 vol% M, where M=Fe, Cu, Co) and 50 vol% electrolyte (10 mol% Scandia-1mol% Ceria- 89 mol% Zirconia). In this work, microwave is introduced to the viscous mixture in a microwave oven to produce anode powders. The synthesized cermet anode powders were then characterized by XRD to determine phase, SEM to analyse powder morphology, TEM to analyse particle size and BET to measure powder surface area.

DO 16

Sandwich Structure Polymer Electrolyte Membranes Containing Phosphotungstic Acid Immobilized Electrospun Nanofibers

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The advances in proton exchange membranes (PEM) is critical for improving the performance of fuel cells [1]. Membranes comprising perfluorosulfonic acid polymers such as Nafion have been used extensively due to their desired conductivity and stability. However, these materials need to be saturated with water to obtain practical level of proton conductivity. There is a strong demand for the PEMs to work at lower relative humidity or under anhydrous conditions because the electrochemical reactions will be accelerated and water management of fuel cell will be simpler. Various designing strategies and advanced materials have been developed to mitigate for this issue without causing serious loss in proton conductivity or stability [2]. Among all, the introducing of inorganic proton conductors such as heteropoly acids have been considered widely. Generally, HPAs (such as phosphotungstic acid $H_3PW_{12}O_{40}$, PWA) have a very strong Brønsted acidity approaching the superacid region (more acidic than Nafion) [3].

In this work, high level of PWA was self-anchored onto nylon electrospun nanofibrous sheet (Figure 1b). Sandwiched proton conducting membranes were fabricated by assembling nanofibrous central layer with outer Nafion layers (Figure 1b). Since the PWA is attached to the polymer backbones, the risk of leaching out is minimized. Moreover, the significant synthetic versatility of the method helps to increase PWA immobilization level. As shown in the Figure 1c, proton conductivity of as high as 60 mS cm^{-1} at 30°C was achieved which is comparable with Nafion 115. The durability of the proton conductivity of sandwiched membrane

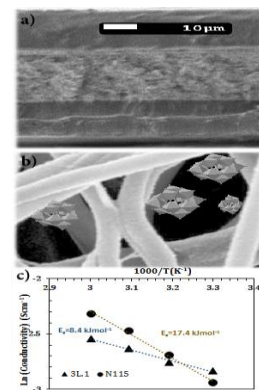


Figure 1: Cross-sectional SEM of sandwiched membrane (a), schematic of central layer (b) and conductivity of membrane

was monitored by leaching test and confirmed with measuring conductivity for 120 h. Result indicated that there is no obvious reduction in conductivity after 120 h of continue running. Along with such desired properties, better fuel cell performance than Nafion115 was obtained.

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DO 17

Catalytic Conversion of Cellulose into Biofuels using Mesoporous Nanoparticles Catalyst

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Cellulose is one of the renewable feedstock which has received intensive attention over the past decade. Many studies have shown that cellulose offers a great potential to be used as a renewable feedstock in abundance with easy availability. Celluloses are abundant and non-food based materials that are considered as the most suitable feedstock for the future energy production. Since cellulose is the most abundant biomass on earth it is considered as one of the most promising feedstock for the sustainable production of chemicals and fuels. Many studies use cellulose as a feedstock for the evaluation of catalysts performance for biomass conversion. Catalyst in the production of biofuels plays an important role to enhance the catalytic reaction in term of productivity, time and cost consuming. In this research, mesoporous silica nanoparticles with high surface area and pore volume will be utilized in the conversion of the cellulose into biofuels via hydrolytic hydrogenation reaction. Hydrolytic hydrogenation is a one-step reaction method in hot-compressed water, which is a promising approach for energy efficiencies in a cellulose conversion. The performance of the mesoporous silica nanoparticles in these applications is dependent on the specific high surface which can absorb specific molecules reactant to convert into final products.

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DO 18

Simulation of aqueous bio-oil fraction for hydrogen production using aspen plus

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Hydrogen generation by steam reforming with in-situ separation of hydrogen in R-Gibbs reactor was simulated via Aspen Plus. Acetic acid and phenol are the selected model compounds were used for this work, descriptive of the main classes of constituents extant in the bio-oil mixed solution. Equilibrium composition of the products was explored in a extensive range of settings such pressure (1–20 atm), steam to fuel (S/F) ratio (1–9) and temperature (100–1000 °C). Every of these two components can be completely converted at low temperatures generating h₂ with extreme yield with the range of 60% to 70% at 600 °C. During the complete range of temperature analysis, S/F ratio certainly was effective on hydrogen generation. In opposition, by growing the pressure starting 1 to 20 atm, hydrogen mole fraction declined. During the aqueous solution steam reforming at varied temperatures, S/F ratios and pressures, the solid carbon formation does not found a problem. The thermodynamic analysis of the steam reforming of bio-oil components thermal decomposition to produce H₂, Co, CH₄, CO₂, water and coke is possible at several amounts subject on the temperature and precise nature of the component. The experimental result does not show suitable agreement with thermodynamic analysis due the ideal assuming of thermodynamic which is never happen in reality. Producing H₂ thermodynamically is exposed to modify the CH₄ reactions equilibrium, with thermodynamic bottleneck removing, and increasing H₂ molar fraction while reversing the opposite pressure effect.