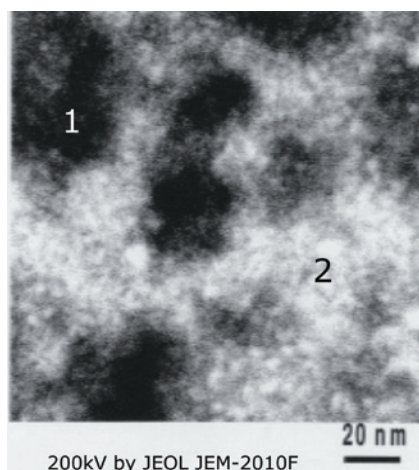


Organic/Inorganic Molecular-Hybrid Polymer Electrolytes for Intermediate Temperature Operation

Polymer electrolyte membrane fuel cells (PEFC) are one of the attractive energy conversion systems to be used in many industrial applications including electric vehicles, mobile telephone, and on-site power generations. Recently, the operation of PEFC at higher temperature (100 - 200°C) has been considered to provide many advantages, such as improved carbon monoxide (CO) tolerance of the platinum electrode, the higher energy efficiency, simplified heat managements, and co-generations. High temperature proton conducting polymer electrolytes have been synthesized through the sol-gel processing of organic /inorganic molecular hybrids. The membrane doped with inorganic acidic clusters shows large proton conductivities up to 160°C under humidified conditions. Proton conductivities of larger than 10^{-2} S/cm at elevated temperatures have been achieved and the conductivity can be correlated with

the nano-phase separation to form bicontinuous inorganic channels in the flexible polymer matrix.



Nano-phase separated structure of the organic/inorganic hybrid membranes synthesized with octane bridging groups, where bicontinuous channels are observed

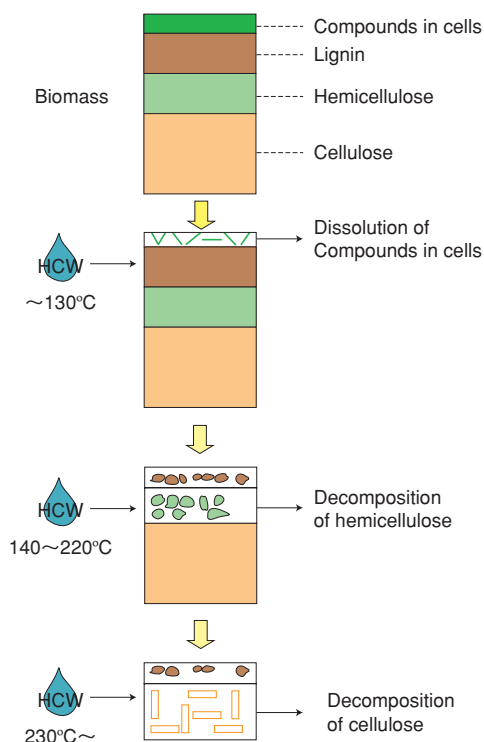
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Development of Environmentally Friendly Hydrothermal Conversion Process of Biomass

- Biomass provides functional food, ethanol, and bio-degradable polymer -

Fractionation process of plant biomass using water alone was proposed as an environmentally friendly conversion process for a maximum utilization of biomass. If water is heated in a closed vessel, the ion product of water increases with increasing temperature and pressure, and the hot compressed liquid water in the vessel comes to have a hydrolysis-ability. Hemicellulose in plant is hydrolyzed to oligomers at temperatures 140-220°C, being functional food which keeps the intestines in healthy state. Then, cellulose is hydrolyzed to glucose and its oligomers above 230°C. These products from cellulose can be converted to ethanol or polylactic acid that are used as a clean energy and bio-degradable polymer, respectively.



Fractional of biomass using not-compressed-water

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