스크롤형 에릭슨 사이클 엔진의 열역학적 특성 연구

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Thermodynamic Characteristics of Scroll-type Ericsson Cycle Engine

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Key Words: Ericsson Cycle(에릭슨 사이클), Scroll Compressor(스크롤 압축기), Scroll Expander (스크롤 팽창기), Heat Engine(열기관), Thermal Efficiency(열효율)

Abstract : The Ericsson cycle is very much like the Stirling cycle, except that the processes of constant-volume regenerative heat transfer are replaced by constant-pressure regenerative process. The efficiency of the Ericsson cycle is the same as that of the Carnot cycle, as in the Stirling cycle. But in the both cases, in spite of the high potentiality of the cycles, it is very difficult to realize the ideal cycle, because neither the isothermal compression nor isothermal expansion in the cylinder or with the turbomachinery is practical. In this paper, it was proposed that the scroll-type compressor and expander is very suitable for approaching the isothermal compression and expansion process of the Ericsson cycle due to the area to volume ratio of scroll geometry and good gas to scroll heat transfer. And the thermodynamic characteristics of the proposed Ericsson cycle engine was investigated.

고분자전해질 연료전지 분리판용 복합재의 전기적/기계적 특성

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Electrical/Mechanical Properties of Composites for Bipolar Plate of PEM Fuel Cell

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Key Words: PEM fuel cell(고분자전해질 연료전지), Bipolar plate(분리판), Electric conductivity (전기전도성), Graphite particle(흑연입자), Mechanical strength(기계적 강도)

Abstract : Fuel cell is one of promising environment-friendly energy sources for the next generation. The bipolar plate is a major component of the PEM fuel cell stack, which take a large portion of the stack cost. In this study, for the alternative materials of bipolar plate of PEM fuel cells, graphite composites were fabricated by compression molding. P-15 particles were mixed with epoxy resin to provide electric conductivity and structural properties. To find out the most suitable electric properties, graphite composites were fabricated with different mixing ratio, processing pressure and temperature. By increasing mixing ratio and fabricated pressure, electric conductivity was improved due to the smaller gap between the particles. In addition, by increasing process temperature, the electric conductivity was also improved probably by the excited molecular activities and resulting low viscosity of the epoxy resin for better fill of the gaps. The results of mechanical test showed that the tensile strength of graphite composite was about 5MPa.