Pengaruh penambahan tekanan compression moulding terhadap karakteristik pelat bipolar komposit (epoxy/carbon EAP - 10% CB) untuk aplikasi PEMFC = The effect of increased pressure of compression moulding on characteristics of carbon-polymer composite bipolar plate (epoxy/carbon EAF-10% CB) for PEMFC application

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Abstrak

Pelat bipolar merupakan komponen penting dalam PEM fuel cell yang berfungsi mendistribusikan bahan bakar gas dan mengalirkan arus listrik antar sel tunggal. Pelat bipolar berkontribusi terhadap peningkatan berat, volume, dan biaya PEM fuel cell. Oleh karena itu dibutuhkan material penyusun pelat bipolar yang mampu mereduksi densitas dan biaya PEM fuel cell, salah satunya adalah material karbon-polimer komposit.

Pada penelitian ini, pelat bipolar karbon-polimer komposit untuk PEM fuel cell dibuat dengan metode compression moulding. Partikel grafit EAF (Electric Arc Furnace) dan partikel carbon black dicampurkan dengan resin epoksi sebagai bahan utama peyusun komposit. Carbon black dibuat melalui proses karbonisasi pada temperatur 600°C selama 10 jam dalam kondisi gas inert (hidrogen) dengan menggunakan sabut kelapa sebagai bahan baku. Komposit dicetak pada temperatur 70°C selama 4 jam di bawah kondisi tekanan 350 kg/cm2, 350 kg/cm2, 400 kg/cm2, dan 450 kg/cm2.

Hasil peningkatan tekanan compression moulding menunjukkan pengaruh terhadap peningkatan kekuatan fleksural dan konduktivitas listrik. Perolehan kekuatan fleksural tertinggi senilai 14,80 MPa, dan konduktivitas listrik tertinggi senilai 0,32 S/cm.

.....Bipolar plates are key component of PEM fuel cell that is used to distribute fuel gas (H2 and O2) and to conduct electrical current between single cells. Bipolar plates contribute in increasing the weight, volume, and cost of PEM fuel cell. Therefore, it needs bipolar plate subtancial materials that can reduce the density and PEM fuel cell cost, one of those materials is carbon-polimer composite.

In this research, a carbon-polimer composite bipolar plate for a PEM fuel cell has been prepared by a compression moulding method. Graphite EAF (Electric Arc Furnace) particles and carbon black particles mixed with epoxy resin were used as the main substances of composite. Carbon black has been prepared by carbonization process at 600°C for 10 hours under gasseous inert (hydrogen) condition with hair of coconut shell as the raw material. The composites were molded at 70°C for 4 hours under pressure conditions 350 kg/cm2, 350 kg/cm2, 400 kg/cm2, and 450 kg/cm2.

The result showed that with increase of pressure of compression moulding, the flexural strength and electrical conductivity increased. The highest flexural strength obtained was 14.8 MPa, and the highest conductivity obtained was 0.32 S/cm.