

CLAIMS

1. A process for producing a catalyst layer for proton exchange membrane fuel cells (PEMFCs), comprising the steps of:
 - 5 a) dispersing biochar derived from water hyacinth (*Eichhornia crassipes*) in a solvent comprising N-Methyl-2-pyrrolidone (NMP) to form a carbon solution;
 - b) homogenizing the carbon solution and integrating a platinum catalyst into the carbon solution to form a suspension;
 - 10 c) sonicating the suspension;
 - d) incorporating a polymeric binder into the suspension to form a catalyst solution;
 - e) applying the catalyst solution onto a substrate to form a coated film; and
 - 15 f) drying the coated film to obtain the catalyst layer.
2. The process of claim 1, wherein the homogenizing in step b) is performed at 10,000 rpm at a temperature of 20 °C to 35 °C for about 20 minutes.
- 20 3. The process of claim 1, wherein the platinum catalyst is integrated at a loading of about 0.1 mg/cm².
- 25 4. The process of claim 1, wherein the polymeric binder is polyvinylidene fluoride (PVDF).
5. The process of claim 1, wherein the drying in step f) comprises drying for about 8 hours at 20 °C to 35 °C followed by an additional 8 hours under vacuum at 60 °C.
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