

**CATALYST LAYER WITH BIOCHAR-BASED CARBON SUPPORT AND
INTEGRATED PLATINUM**

ABSTRACT OF THE DISCLOSURE

5

The present utility model relates to a catalyst layer for proton exchange membrane fuel cells (PEMFCs). The catalyst layer comprises a carbon support film formed from biochar derived from water hyacinth (*Eichhornia crassipes*), a platinum catalyst
10 integrated into the carbon support film, and a polymeric binder. The integration of platinum into the biochar-based carbon support provides a uniform and stable catalytic film with enhanced electrochemical activity. The catalyst layer is further characterized by its self-supporting structure, uniform
15 morphology, and durability under oxidative and thermal conditions, making it suitable for PEMFC applications.