A 3D Porous Wrinkled Graphitic Carbon

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The life span of proton-exchange membrane fuel cells heavily relies on the durability of the carbon support of cathode catalysts. However, commercial carbon supports face the challenge of balancing porosity, surface area, and electrochemical stability. To address this issue, a 3D porous wrinkled graphitic carbon (PWGC) is designed and synthesized using a catalyst-free, plasma-enhanced chemical vapor deposition approach [1]. The resulting PWGC possesses a hierarchically porous structure with a high surface area, a high degree of graphitization, and exceptional corrosion resistance at the same time. As a result, the Pt/PWGC catalysts with the use of PWGC as the carbon support demonstrate superior high potential stability compared to those made with KB and VC as the carbon support. The catalysts also show significantly improved durability in membrane electrode assembly tests. After 5K voltage cycles from 1.0 to 1.5V, the retention of electrochemically active surface area approaches 56.8%, surpassing the 23.6% retention of commercial Pt/C catalysts tested under the same conditions.

References

[1] Pengshuo Fan, Yizhou Hao, et al., "A Porous Wrinkled Graphitic Carbon as Corrosion-Resistant Carbon Support for Durable Fuel-Cell Catalysts", Adv.Mater.Technol. 2023, 2300389

Figures

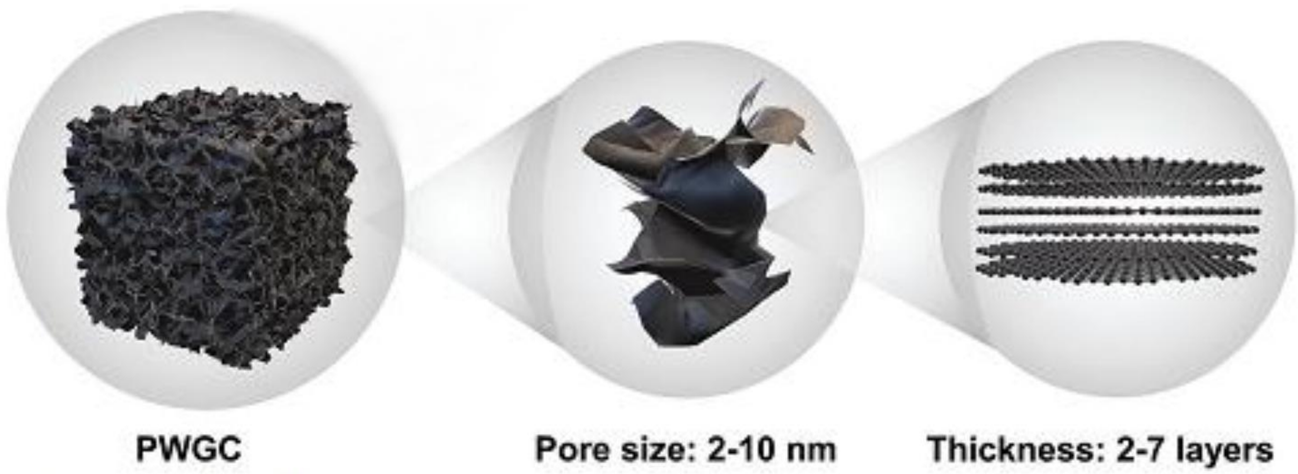

Figure 1: Schematic diagram of the microstructure of PWGC.

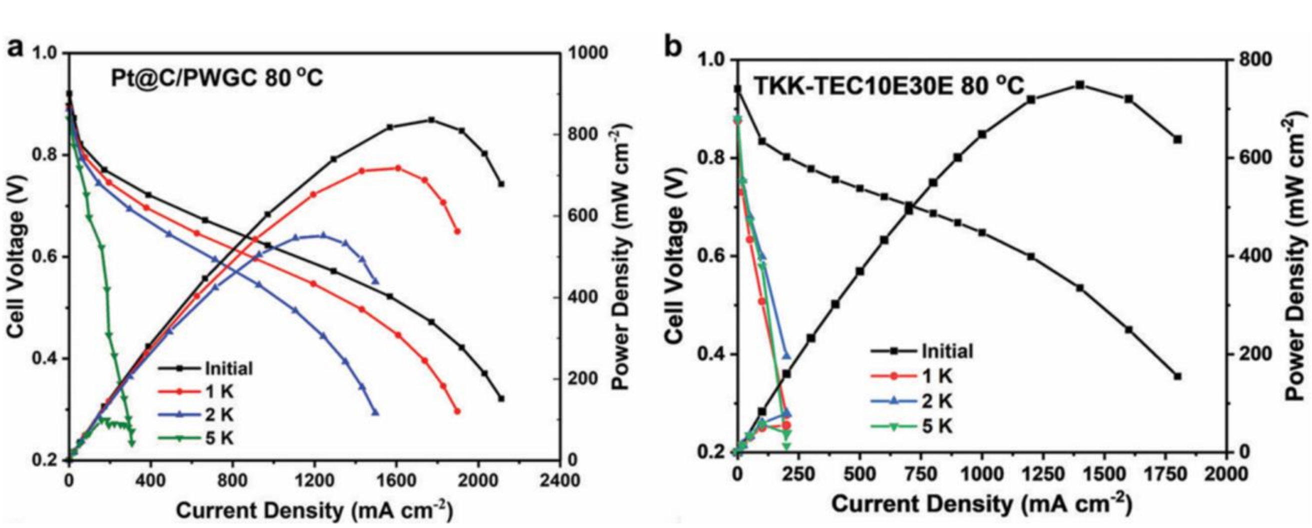

Figure 2: MEA performance of a) Pt@C/PWGC and b) a commercially available catalyst TKK-TEC10E30E during high potential accelerated stress tests.