RAPID SYNTHESIS OF A PT1RU1/CARBON NANOCOMPOSITE USING MICROWAVE IRRADIATION: A DMFC ANODE CATALYST OF HIGH RELATIVE PERFORMANCE

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Thermal treatment of (Pt,Ru) molecular precursor/Vulcan carbon composites under appropriate oxidizing and reducing conditions using microwave dielectric loss heating affords PtRu/Vulcan carbon nanocomposites consisting of PtRu alloy nanoparticles highly dispersed on a powdered carbon support. Two such nanocomposites containing 16 or 50 weight percent total metal and alloy nanoclusters of 3.4 or 5.4 nm average diameter are formed, respectively, within only 100 s or 300 s of total microwave heating. XRD and on-particle EDS analyses reveal that the resulting PtRu nanoparticles have a nearly 1:1 alloy stoichiometry. Preliminary measurements of the catalytic activity of these nanocomposites as supported direct methanol fuel cell (DMFC) anode catalysts indicate that the 50 wt % nanocomposite has a performance superior to that of a 60 wt % commercial supported catalyst and a normalized performance equivalent to that of a proprietary unsupported Pt1Ru1 catalyst.

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