Electronic Supplementary Material (ESI) for New Journal of Chemistry. This journal is © The Royal Society of Chemistry and the Centre National de la Recherche Scientifique 2024



Figure 1S. EDX analysis of (a) Ni₃Au₁-NGQD (b) Ni₁Au₁-NGQD (c) Ni₁Au₃-NGQD

electrocatalysts.



Figure 2S. XRD patterns of Ni_1Au_3 -NGQD, Ni_3Au_1 -NGQD and Ni_1Au_1 -NGQD

electrocatalysts.



Figure 3S. The effect of temperature on cyclic voltammetry curves of (a) Ni_1Au_3 -NGQD (b) Ni_3Au_1 -NGQD (c) Ni_1Au_1 -NGQD electrocatalysts at the scan rate of 100 mVs⁻¹; (d) The plot of Ln Ip vs. 1/T for three electrocatalysts in NaOH 0.5 M containing ethanol 0.5



Figure 4S. The effect of temperature on cyclic voltammetry curves of (a) Ni_1Au_3 -NGQD (b) Ni_3Au_1 -NGQD (c) Ni_1Au_1 -NGQD electrocatalysts at the scan rate of 100 mVs⁻¹; (d) The plot of Ln I_p vs. 1/T for three electrocatalysts in NaOH 0.5 M containing formate 0.5



Figure 5S. The comparison graph of fuel cell results for Ni_1Au_1 -NGQDs as anodic electrocatalyst at 60 °C using Pt/C as cathodic electrocatalyst in formate and ethanol fuel

cells.