Electronic Supporting Information

Ni(II) dithiolate anion composites with two-dimensional materials for electrochemical oxygen evolution reactions (OER)

Ayushi Singh[a], Amita Singh[a,b], Gabriele Kociok-Köhn[c], Kieran C. Molloy[d], Ashish Kumar Singh[e]*, Abhinav Kumar[a]* and Mohd. Muddassir[f]

Synthesis of [Ni($S_2C_2Ph_2$)$_2$]

Benzoin (2.12 g, 10 mmol) was refluxed with P_2S_5 (3.33 g, 15 mmol) in 30 ml of dioxane for 2 h. During this period, the thiophosphoric ester of dithiobenzoin was formed. The hot reaction mixture was filtered to remove the excess P_2S_5 and a solution of $NiCl_2.6H_2O$ (1.16 g, 4.9 mmol) in 8 ml distilled water was added to the filtrate. The reaction mixture was heated on steam bath for 2 h. Black crystal of the complex was formed which were collected filtration, washed with a minimal amount of dioxane, water, ethanol, and finally with diethyl ether. Purification was conducted by recrystallization from boiling toluene to afford 1.63 g of green-black crystals, (0.325 g, yield 60%). $C_{28}H_{20}S_4Ni$ (541.98): calcd. C, 61.89, H, 3.71, S, 23.60; found: C, 61.74; H, 3.63; S, 23.23 %. ^{1}H NMR ($CDCl_3$, δ): 7.26, (d, 4H), 7.28 (d, 4H), 7.34-7.35 (m, 8H), 7.38-7.39 (m, 4H). ^{13}C NMR ($CDCl_3$, δ): 128.4, 128.8, 128.9, 141.2 (C_6H_5), 181.5 (C=C). IR (KBr, cm^{-1}): 1571, 1493, 1442, 1361, 1138, 882, 749, 696, 409. UV–Vis (CH_2Cl_2, nm) λ_{max}: 270, 317, 598, 857.

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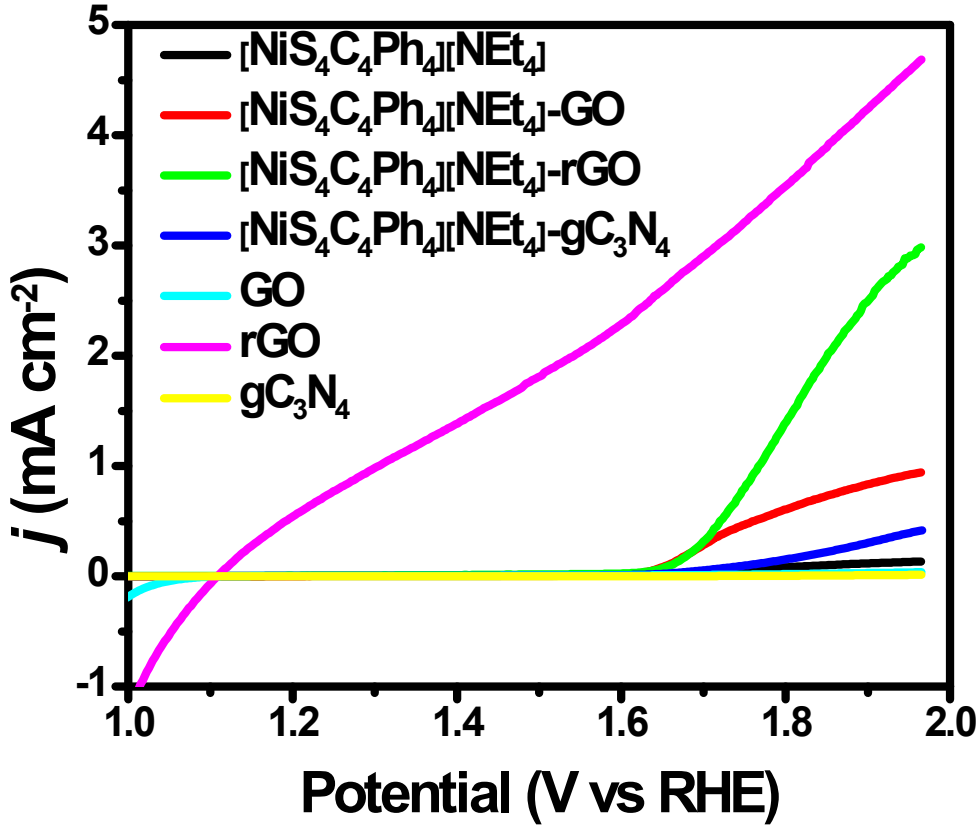

Fig. S1: LSV profile of 1, its composite with 2D materials and 2D materials.