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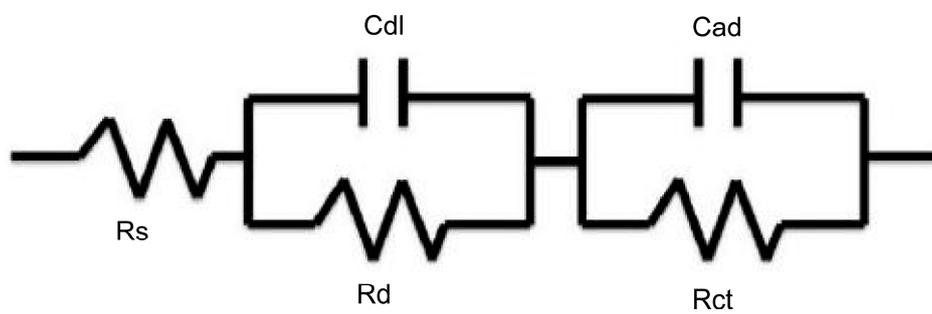**Experimental Methods**

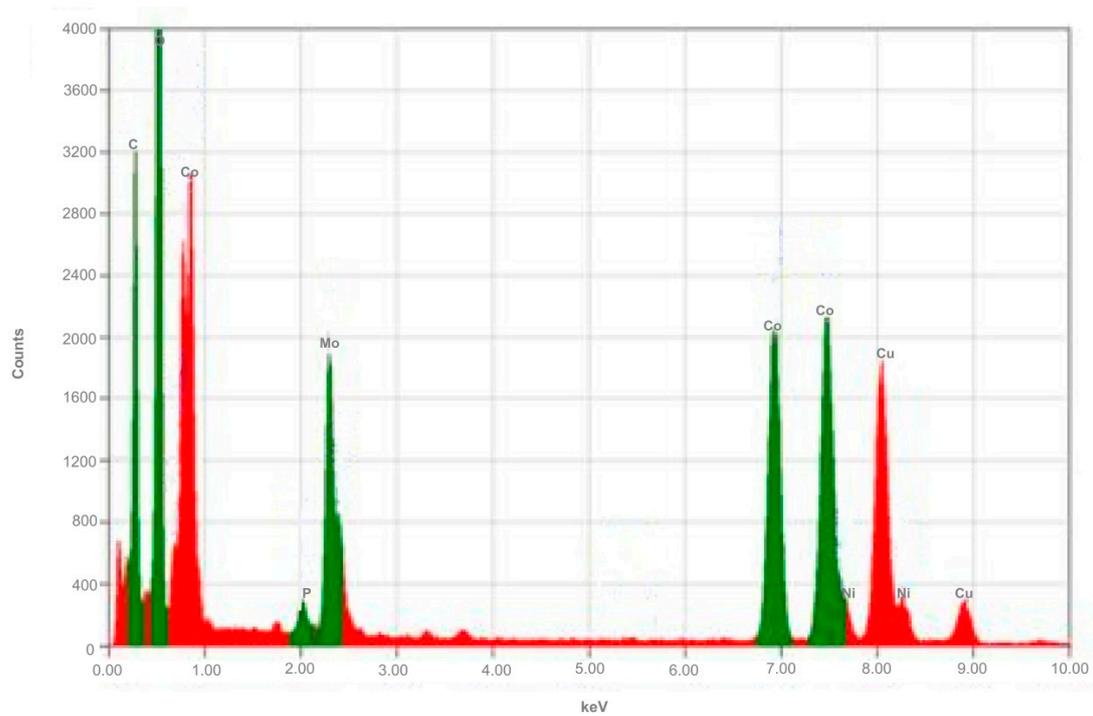**Figure S1.** Equivalent circuit diagram.

Figure S2. EDS image of Ni$_2$Co$_2$@T-PZ.

Experimental Methods

1. Linear Sweep Voltammetry (LSV)

During the test, the open circuit potential was measured at first. When the open potential was stable, the LSV test was carried out starting from its open potential, and the scan was started at a rate of 0.1 mV s^{-1}.

2. Electrochemical Impedance Spectroscopy (EIS)

An open circuit voltage with an amplitude of 5 mV and a frequency of 0.001~100000 Hz was used as the test voltage for testing. The results were fitted according to ZSimpWin. The equivalent circuit was R(CR)(CR), as shown in Figure S1. Ohmic resistance (Rs), layer capacitance (Cdl), charge transfer resistance (Rct), void adsorption capacitance (Cad), and diffusion resistance (Rd) can be calculated by fitting, and the total resistance of the battery can be calculated. In addition, the total ohmic resistance (Rt) in the fuel cell anode system represents the sum of the resistance values of Rs, Rct, and Rd. The obtained data was fitted by equivalent circuit diagram R(CR)(CR). The intersection point between the curve and the left side of the axis in the high frequency region represents the Ohmic resistance (Rs), the curve diameter of the semicircle represents the charge transfer resistance (Rct) of the anode, and the short straight line in the low frequency region represents the diffusion resistance (Rd).

3. Tafel Test (Tafel)

The Tafel curve test option in the electrochemical workstation (CHI-660E) was selected for testing, the sweep speed was set to 1 mV s^{-1}, and the initial and termination voltages were set to open circuit voltage ± 0.1 V. Tafel slope and exchange current density are two important parameters of reaction catalyst performance. Tafel slope represents the relationship between current change and overpotential within a certain range. Exchange current density (I$_0$) reflects the ability of an electrode to gain and lose electrons in reaction, that is, the degree of difficulty that can be used for reactions.

4. Power Density Curve and Polarization Curve

The power density curve and polarization curve are two important indicators of battery performance. In the experiment, a three-electrode system with saturated HgO electrode as reference electrode, hydrophobic carbon cloth as the electrode, and activated carbon foam nickel doped with catalyst as the anode was tested. The electrode was connected to the multimeter. When the open circuit voltage was stable, the resistance box was connected to the resistor in parallel, and the resistance size of the resistance box was adjusted from 9000 Ω to 3 Ω. After the resistance was adjusted by the resistance box, the multimeter data was recorded after the voltage was stable. The power density of the battery, and the polarization data of the anode and cathode, were calculated according to the formulas (1) and (2), and then the picture was drawn with Origin.

$$I=U/RS \tag{1}$$

$$P=U×I \tag{2}$$

Where I is the current density (A m^{-2}), U is the voltage (V), R is the resistance box resistance (Ω), S is the electrode area, and P is the power density (W m^{-2}).