

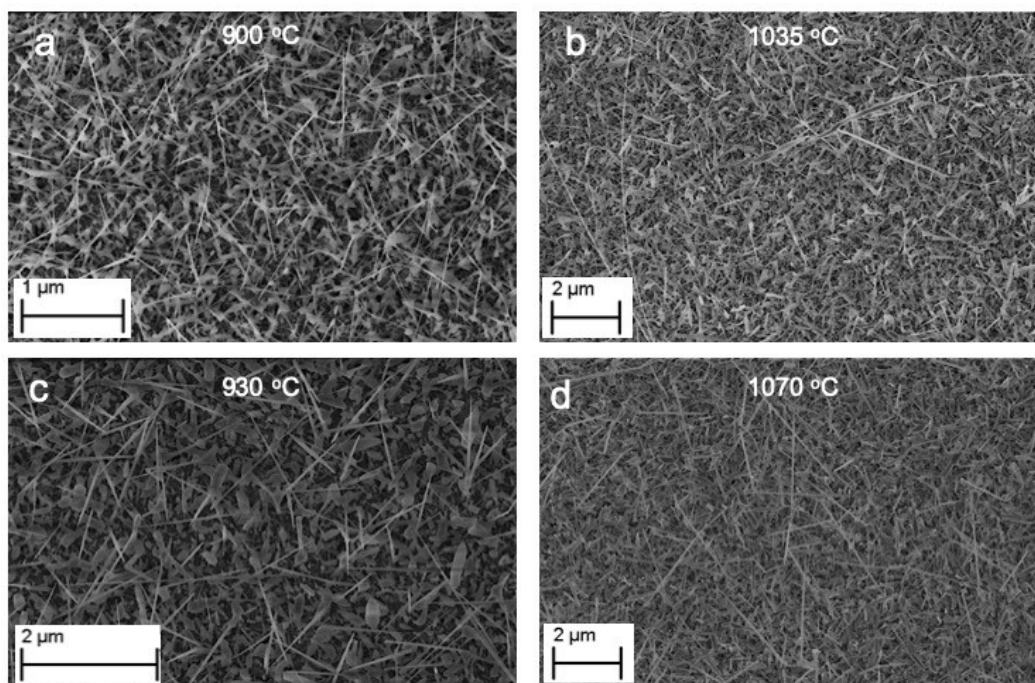
## NiO-GDC Nanowires Anode for SOFC: Novel Growth, Characterization and Cell Performance

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### 1. Optimization of substrate temperature for Nanowires Synthesis

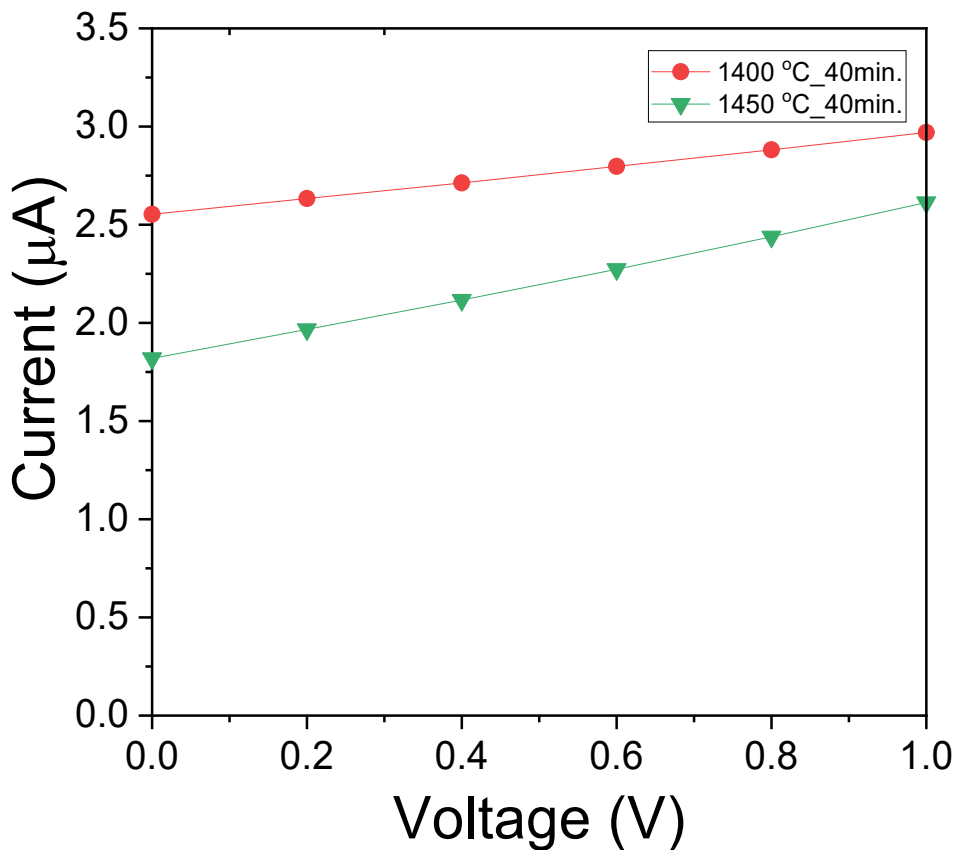
To optimize substrate temperature for nanowires growth, the Au-catalyzed alumina substrates were placed inside the tubular furnace at different temperature regions. Figures S1a and S1b showed the SEM images of NiO-GDC nanowires grown at substrate temperatures 900 °C and 1035 °C respectively (deposition was carried out at the evaporation temperature 1400 °C). While, for deposition carried out at 1450 °C, figures S1c and S1d represents the SEM images of NiO-GDC nanowires grown at substrate temperatures of 930 °C and 1070 °C respectively. Clearly in all the cases, extremely low-density growth of nanowires were achieved. However, with the further increase in substrate temperature i.e. at 1120 °C (1400°C) and 1170 °C (1450 °C), a dense morphology were obtained (see figure 3).



**Fig. S1** FE-SEM images of nanowires grown at different substrate temperatures (substrate temperature is written on the SEM images). For figures S1a and S1b the evaporation temperature is 1400°C, while for figures S1c and S1d the evaporation temperature is 1450°C.

## 2. V-I characteristics of NiO-GDC Nanowires at different temperatures

The I-V characteristic of the nanowires were also acquired at constant temperature of 500 °C and are shown in figure S2. The non-zero values of current at 0V is associated with thermally generated charge-carriers at 500 °C. This implies that at 500 °C NiO-GDC nanowires exhibit excellent conductivity (hence offer low resistance) to the flow of thermally generated charge carriers which leads to the flow of current even at 0V. In both the cases, the current tends to increase with voltage. However, the nanowires grown at evaporation temperature of 1400 °C possesses higher current , which again confirms the superior structural and electrical properties of these nanowires as compared to one grown at 1450 °C.



**Fig. S2** I-V characteristics of NiO-GDC Nanowires prepared at different growth conditions at constant temperature of 500 °C.