

## Visible-Light Responsive BiNbO<sub>4</sub> Nanosheets Photoanode for Stable and Efficient Solar-Driven Water Oxidation

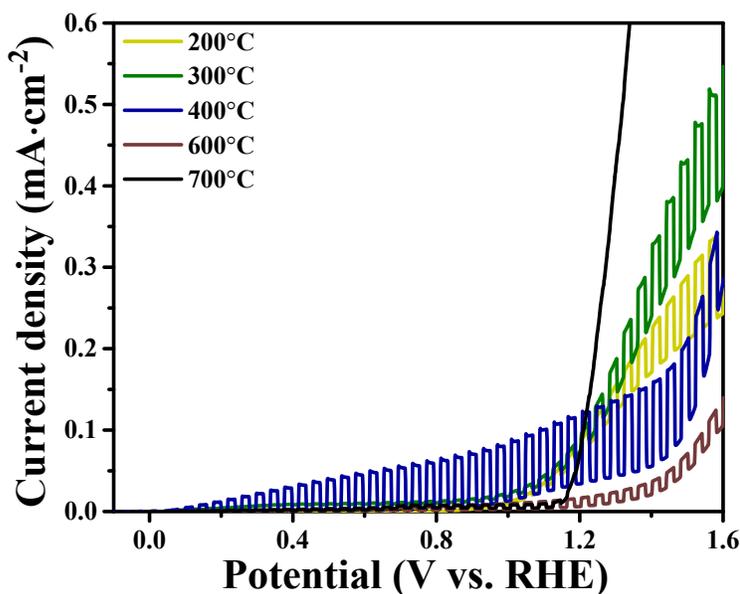
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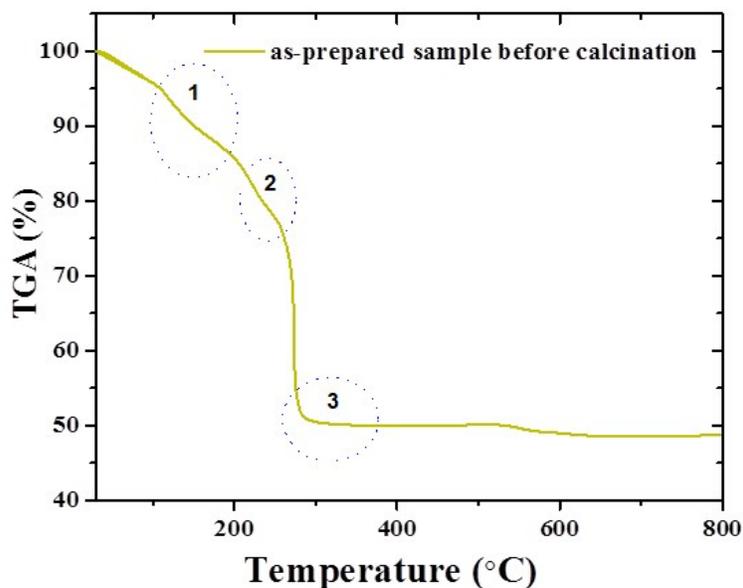
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**Figure S1.** Chopped LSV plots of BiNbO<sub>4</sub> film at various temperatures.

PEC performances at low and high-temperature annealed films were studied and the obtained result is shown in Figure S1. In the case of 200-300 °C, PEC behavior is not stable in the allowed potential range, whereas the photocurrent density ( $J$ ) is increased in 400 °C due to the formation of the partial crystalline film. However, in the range of 600-700 °C, the  $J$ s are decreased, mainly

attributed from the deformation of conductive FTO substrate in the high-temperature environment. On the other hand, the 500 °C and 550 °C annealed films showed a meaningful difference in the photoelectrochemical performance.



**Figure S2.** TGA plots of the as-prepared BiNbO<sub>4</sub> sample.

In order to estimate the thermal stability and crystalline phase at the optimum calcination temperature,<sup>[1]</sup> Thermal Gravimetric Analysis(TGA) is performed using the as-prepared sample as shown in Figure S1. In TGA data, the weight loss of approximately ~50% is done in three stages from room temperature to 800 °C. The initial weight loss of ~9% in the TG curve starts at 109 °C, corresponding to the evaporation of water and chemically bounded water in the precursor sample. In the second stage, the continuous transformation at 220 °C showing weight loss of about 15% can come from the decomposition of the organic constituents in the precursor. Furthermore, an intensive weight loss of about 25% occurring at 250 °C can be attributed to the residual hydroxide to the amorphous BiNbO<sub>4</sub> phase. In addition, the slight weight loss of about 1

% that occurs at temperatures of 500–580 °C may be attributed to the beginning of the formation of the ordered crystalline phase, which can be verified in the XRD results. Also, there is no significant thermal effect was observed over 580 °C in the TGA plot, which indicates the stable crystalline phase structure formed at 550 °C.

**Reference:**

- 1 C. Balamurugan, AR. Maheswari, M. Parmar and D.-W. Lee, *RSC Adv.*, 2014, **4**, 54625-54630.