

## Electronic Supplementary Information

### **Electrochemical synthesis of p-CuO thin films and development of a p-CuO/n-ZnO heterojunction and its application as selective gas sensor**

Amrita Ghosh<sup>a</sup>, Bibhuti Bhushan Show<sup>b</sup>, Sugato Ghosh<sup>c</sup>, Nillohit Mukherjee<sup>c</sup>, Gautam Bhattacharya<sup>d</sup>,

Swapan K. Datta<sup>c</sup> and Anup Mondal<sup>a\*</sup>

<sup>a</sup> *Department of Chemistry, Indian Institute of Engineering Science & Technology (formerly Bengal Engineering and Science University), Shibpur, Howrah-711103, India*

<sup>b</sup> *Department of Chemistry, Jadavpur University, Kolkata-700032, India*

<sup>c</sup> *Centre of Excellence for Green Energy and Sensor Systems,  
Indian Institute of Engineering Science & Technology (formerly Bengal Engineering and Science University), Shibpur, Howrah-711103, India*

<sup>d</sup> *Department of Physics, RKM Vidyamandira, Belur, Howrah-711 202, India*

#### **AUTHOR INFORMATION**

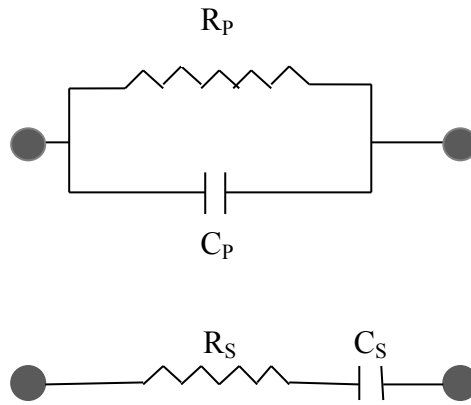
Corresponding Author: Anup Mondal

\*E-mail: anupmondal2000@yahoo.co.in

Tel.: 91 33 26684561 extn. 497

Fax: 91 33 2668 2916

The heterojunction device can be represented by the following equivalent circuits:



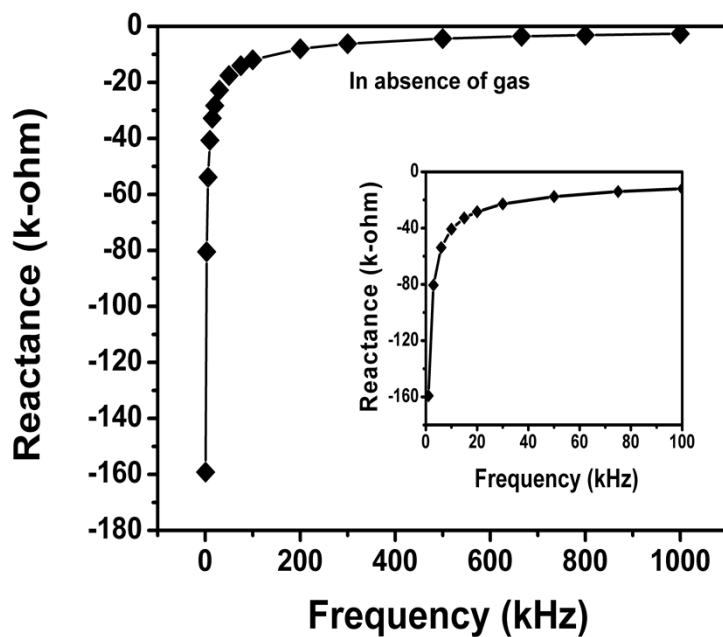
Where,  $R_p$  (resistance) ,  $C_p$  (capacitance) are in parallel and  $R_s$  (resistance) ,  $C_s$  (capacitance) are in series when carrying out the A.C. measurements in LCR meter both in presence and absence of  $\text{CH}_4$  gas.

The reactance of the device is given by  $X = -\frac{1}{\omega C_s}$

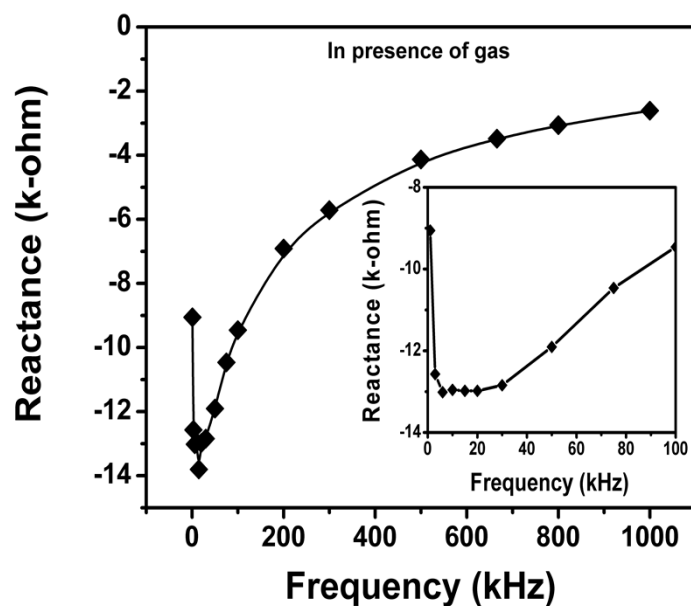
where,

$$C_s = C_p + \frac{1}{\omega^2 R_p^2 C_p}$$

Plots of reactance (calculated from  $R_p$  and  $C_p$ ) of the device with frequency are shown in the following figures. Reactance value matches exactly with that calculated from  $C_s$  (shown in Figure 11 (a) and (b) in the manuscript).



**Fig. S1.** Frequency dependence of reactance of the heterojunction in absence of gas (inset carries image of the significant zone).



**Fig. S2.** Frequency dependence of reactance of the heterojunction on CH<sub>4</sub> gas exposure (inset carries image of the significant zone).