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Synthesis of boron-doped carbon nanotubes by thermocatalytic decomposition of ethanol using floating catalyst chemical vapor deposition method: Kinetic study

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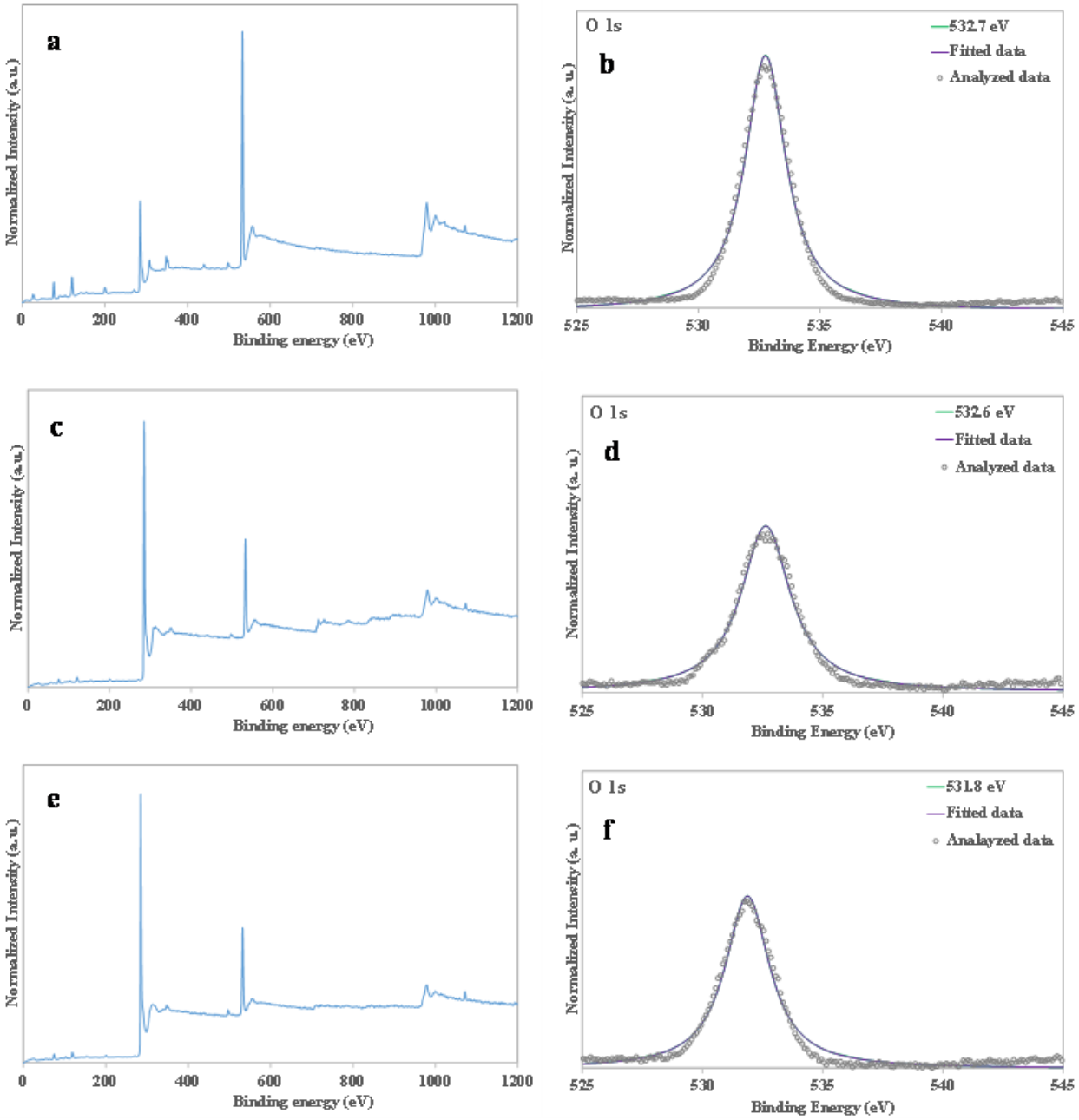

Fig. S1 XPS survey spectra for BCNTs synthesized at temperature (a) 750, (c) 850, and (e) 950°C, respectively. O 1s spectra for B-CNTs synthesized at temperature (b) 750, (d) 850, and (f) 950°C, respectively.

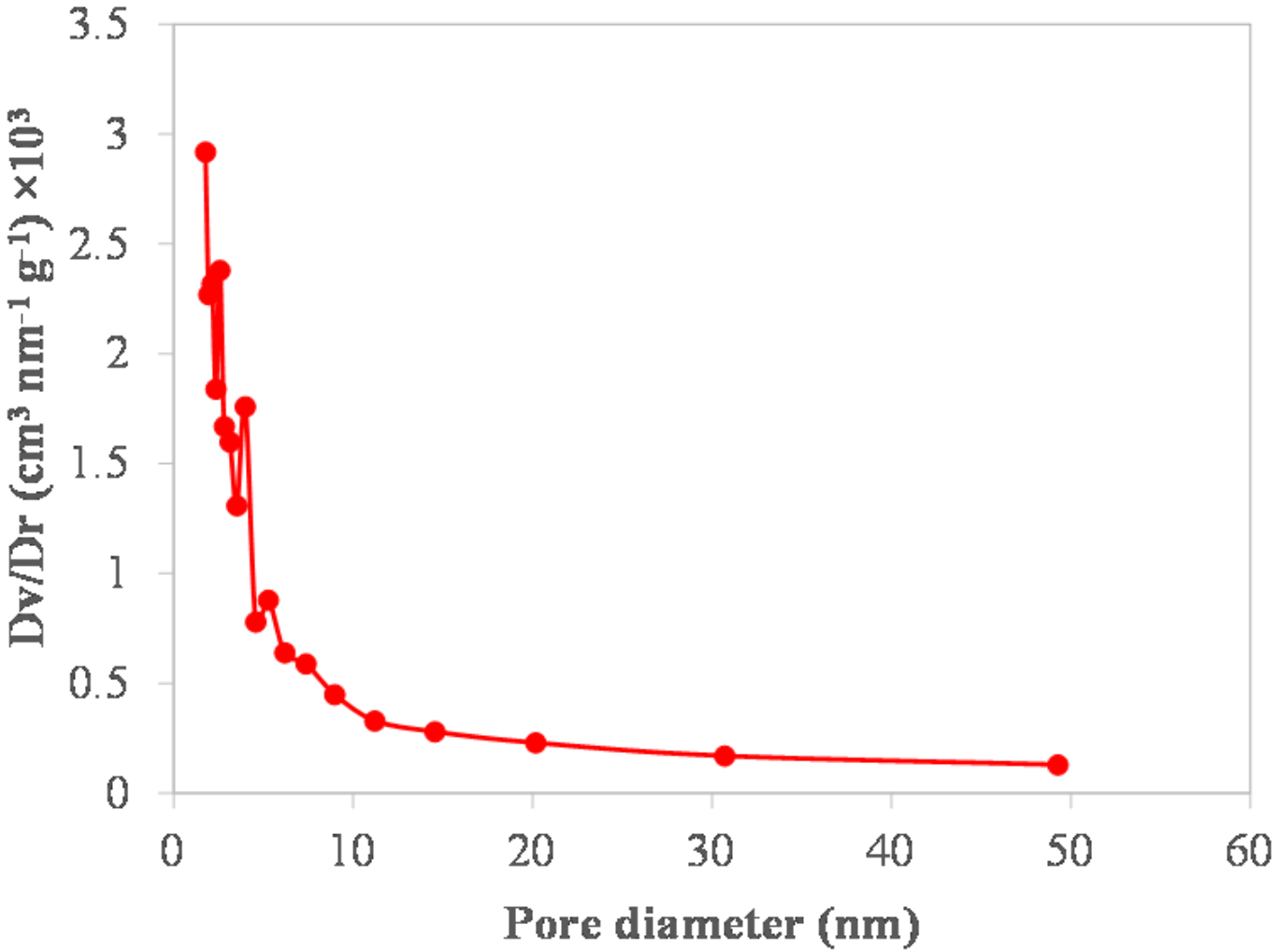

Fig. S2 Pore size distribution curve for synthesized BCNTs at temperature 850 ℃

- The Rate law determination-

To find out the correct meaning of the above-mentioned findings and to develop the rate law, several empirical and kinetic models can be fitted to the experimental data. Therefore, few empirical models corresponding to power law were considered for experimental data fittings-

$$\text{Rate} = K^{*}(P_{EtOH})^{n}$$

Here, is kinetic rate constant, is partial pressure of Ethanol and n is order of reaction. The value of n was varied from 1, 0.5 and 2 and the subsequent values of rate of formation of BCNTs with respect to is shown in **Fig. S3**. It can be observed that power law model is not able to predict the rate of formation over the entire range of . On the other hand, the kinetic model reported in manuscript is able to predict the rate of formation of BCNTs with better fitting.

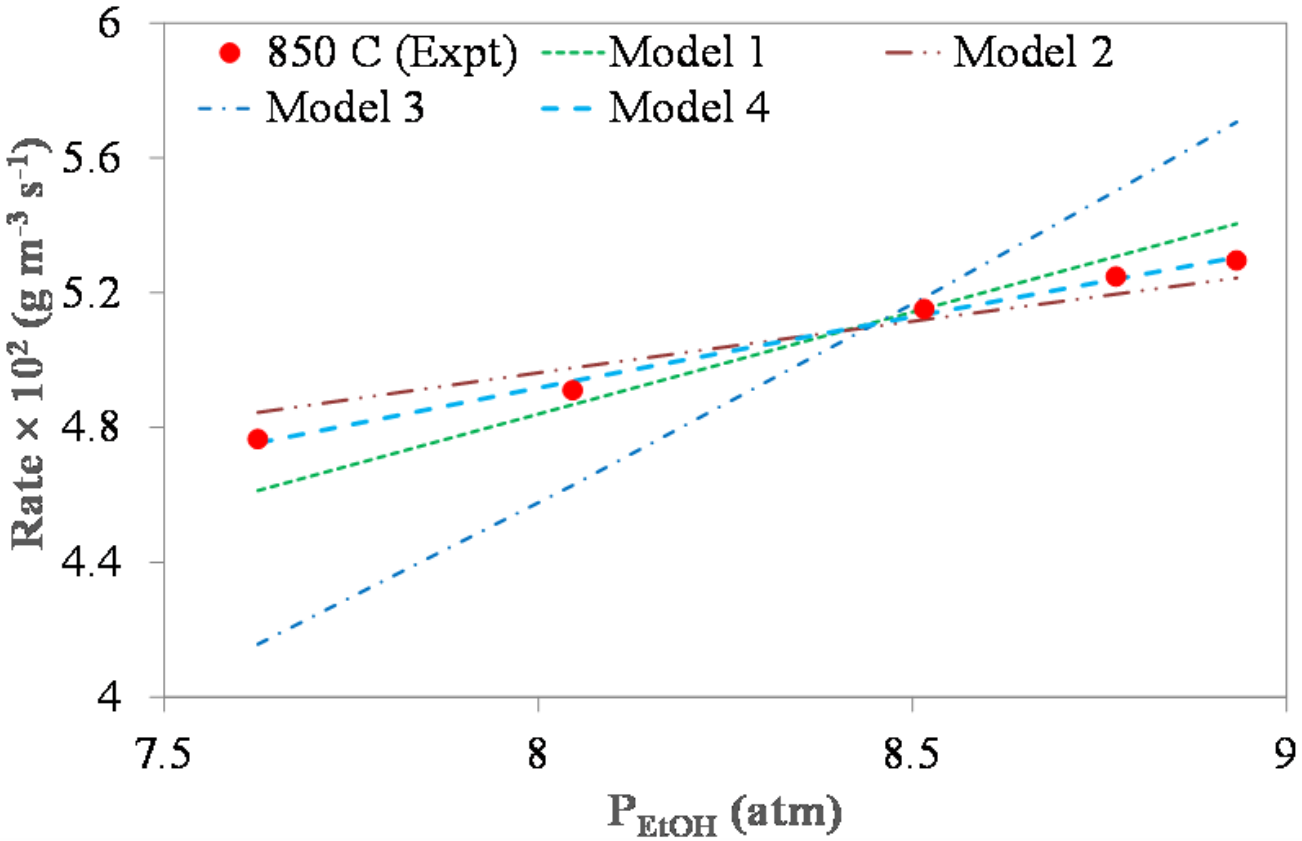

Fig. S3 Plot of the rate of formation of BCNTs vs. P_{EtOH} at 850°C (the ----- dotted lines shows the rate of BCNTs calculated using different empirical models). Here, the equations for proposed models as below,

Model 1	$R = K\,P_{EtOH}$	Model 2	$R = K\sqrt{P_{EtOH}}$
Model 3	$R = K(P_{EtOH})^2$	**Model 4**	$R = \dfrac{k \times P_{EtOH}}{[1 + K \times P_{EtOH}]}$