

## Supporting Information

### **Suppression of lithium dendrite by triazine -based porous organic polymer laden- PEO based electrolyte and its application for all-solid-state-lithium batteries**

N. Angulakshmi<sup>2</sup>, R. Baby Dhanalakshmi<sup>1</sup>, Murugavel Kathiresan\*<sup>1</sup>, Yingke Zhou<sup>2</sup> \*  
A. Manuel Stephan<sup>1</sup>\*

<sup>1</sup> CSIR- Central Electrochemical Research Institute, Karaikudi 630 003, India

<sup>2</sup> The State Key Laboratory of Refractories and Metallurgy, Institute of Advanced Materials and Nanotechnology, College of Materials and Metallurgy, Wuhan University of Science and Technology, Wuhan 430 081 P.R. China

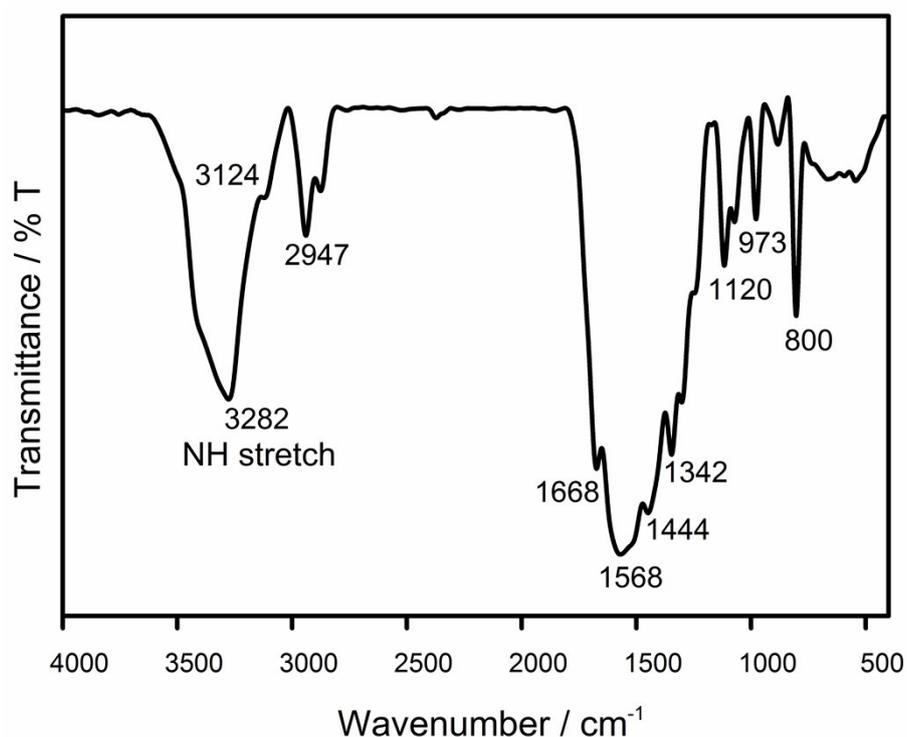
\*Corresponding authors

[amstephan@cecri.res.in](mailto:amstephan@cecri.res.in); [zhouyk@wust.edu.cn](mailto:zhouyk@wust.edu.cn)

[kathiresan@cecri.res.in](mailto:kathiresan@cecri.res.in)

## Synthesis of TP-POP

In a clean two-neck round-bottomed flask, 1,4-phenylenediamine (1.45 g, 13 mmol) was dissolved in 50 mL anhydrous 1,4-dioxane under  $N_2$  atmosphere. Later, anhydrous  $K_2CO_3$  was added and the solution was cooled down to 5 °C under  $N_2$  atmosphere. To this cooled solution, cyanuric chloride (2.5 g, 13.5 mmol) dissolved in 50 mL 1,4-dioxane was added drop wise over 2 h. Then the solution was slowly warmed to room temperature. The contents were then transferred to a stainless steel lined Teflon tube and heated at 100 °C for 10 h. The suspension was cooled to room temperature, diluted with cold water (500 mL). The pale brown precipitate was filtered, washed several times with water, methanol and acetone. The resulting precipitate was dried under vacuum to yield the title compound **TP-POP** as a brown powder (Yield: 82%).

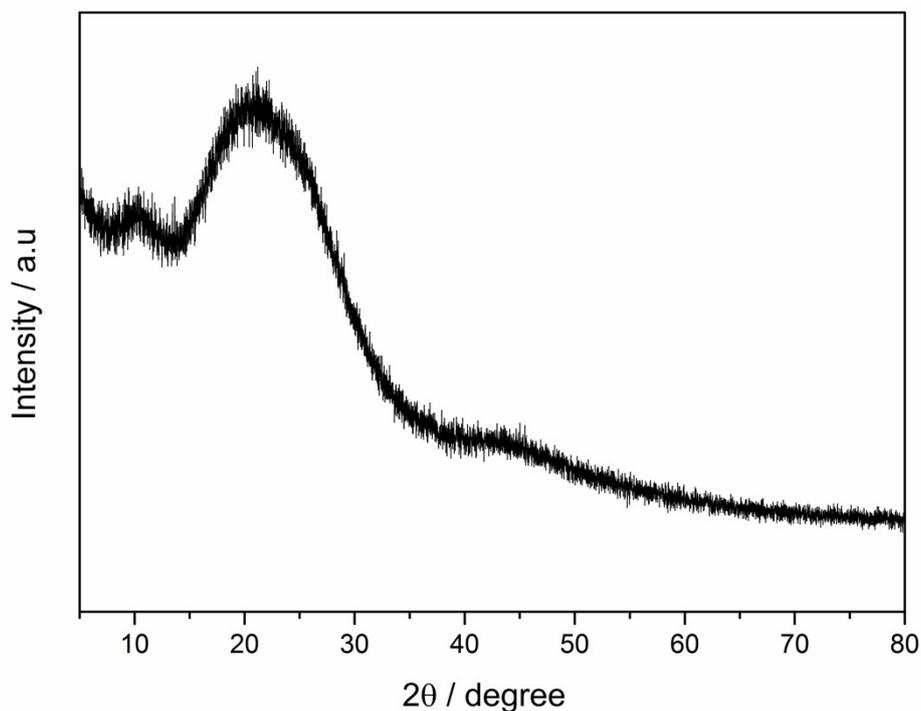


**Figure S1. FT-IR spectrum of TP-POP**

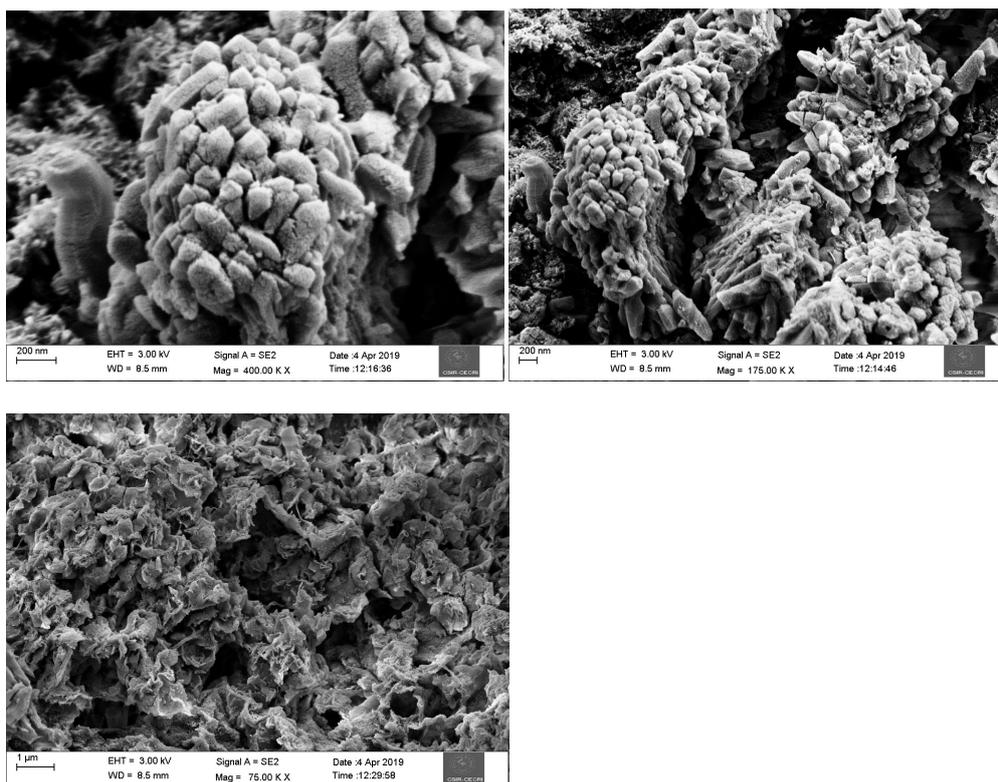
The successful conversion of the starting materials to TP-POP was confirmed by FT-IR analysis and FT-IR spectrum matches well with our previous report.<sup>1</sup> The peaks at 1568  $cm^{-1}$  and 1342  $cm^{-1}$  are assigned to triazine ring. The presence of imine functionality is indicated by C=N stretching bands at 1668 and 1120  $cm^{-1}$ . The typical breathing mode of vibration of

triazine is observed at  $800\text{ cm}^{-1}$ . Further, the absence of C-Cl stretching vibration at  $850\text{ cm}^{-1}$  confirms the absence of cyanuric chloride, starting material.

The PXRD pattern of TP-POP is given in Figure S2. A broad peak is observed indicating the amorphous nature of the sample with a  $2\theta$  value of  $21.17^\circ$ . XRD value of TP-POP differs very much from that of the solvothermally synthesized material indicating the difference in their structures.<sup>1</sup>

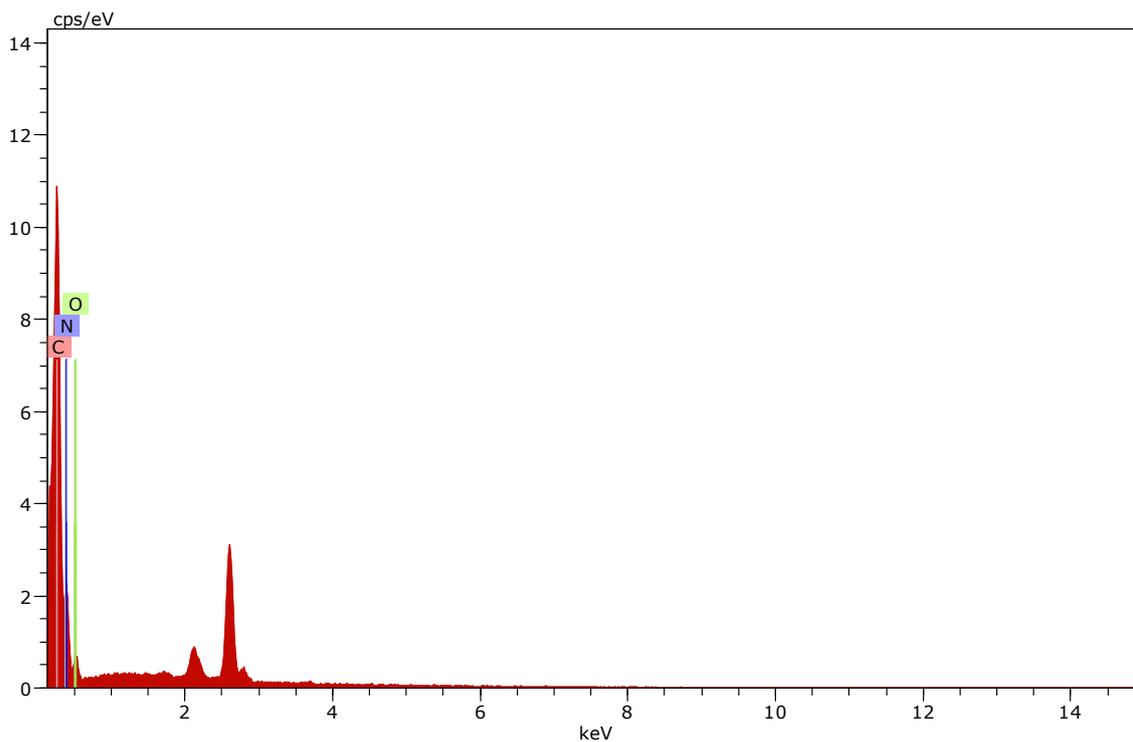


**Figure S2. XRD patterns of TP-POP**



**Figure S3. FESEM images of TP-POP at different magnifications**

The morphology of TP-POP was analyzed using field emission scanning electron microscopy (FESEM) and is given in Figure S3. TP-POP exhibit microspherical structures with an estimated average diameter of  $\sim 100$  nm. In addition, mesoporous nature of the microspheres and strong aggregation between the polymeric units can be clearly explained from the FESEM images.



**Figure S4. Energy Dispersive X-ray analysis (EDS) of TP-POP**

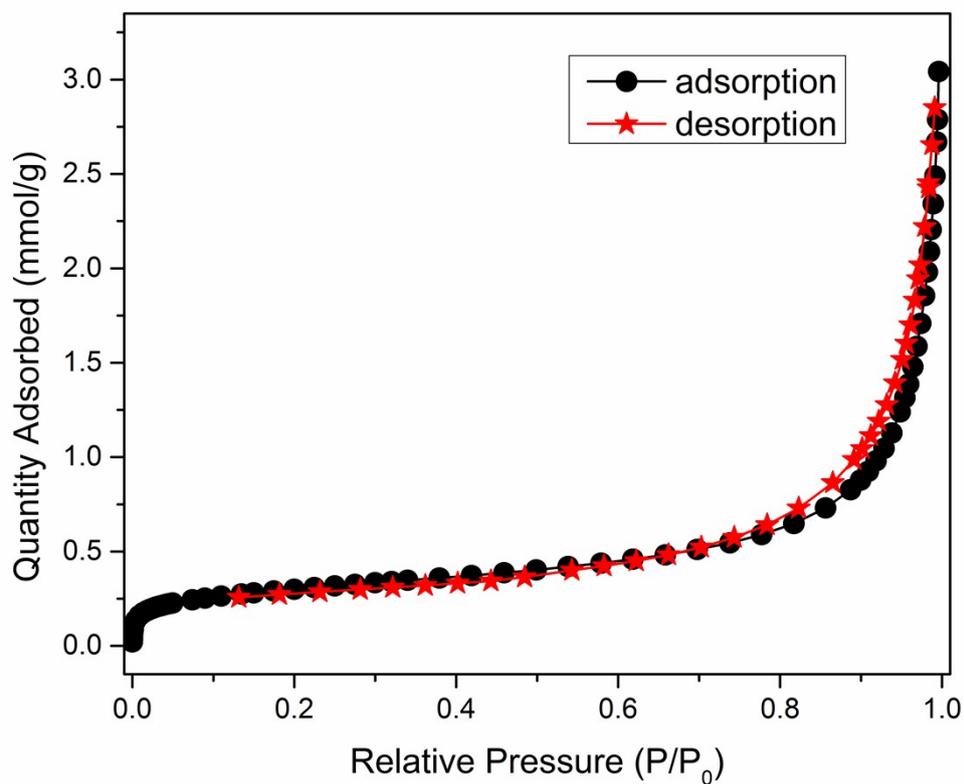
The elemental content of TP-POP as obtained from CHNS analysis and Energy Dispersive X-ray analysis are given below.

**Elemental analysis**

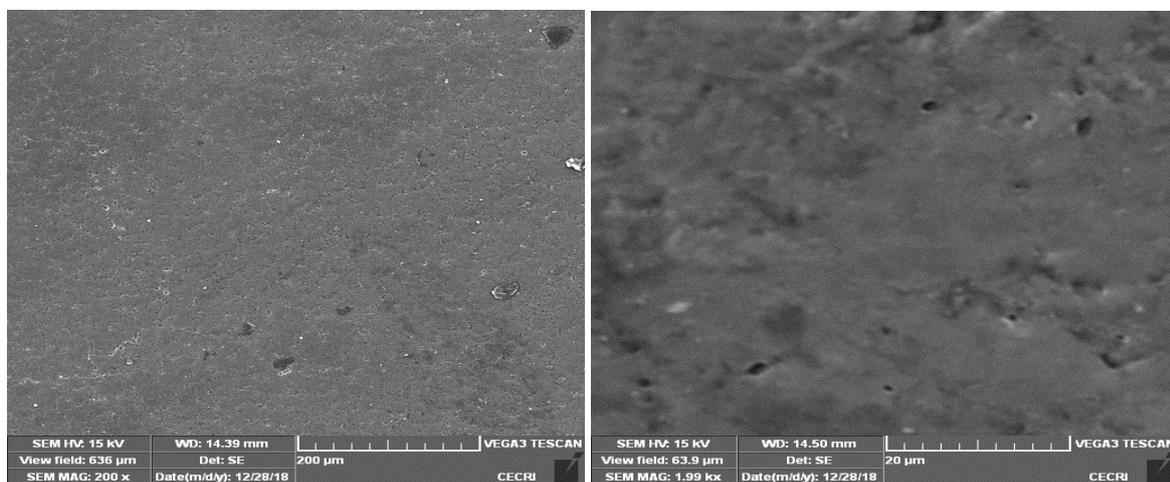
Sample	Calculated %			Found %		
	C	H	N	C	H	N
TP-POP	56.99	3.47	33.57	49.65	3.20	29.52

**EDS obtained from SEM**

Sample			
TP-POP	C	O	N
	49.45	8.52	42.03



**Figure S5.** The N<sub>2</sub> –sorption isotherms of TP-POP



**Figure S6.** SEM images of sample S4 for two different magnifications

**Reference**

1. S. Gopi and M. Kathiresan, *Polymer*, 2017, **109**, 315-320.