

## Supplementary information for

# *Operando* soft X-ray absorption spectroscopic study on microporous carbon-supported sulfur cathodes

*Yao Xiao<sup>a</sup>, Kentaro Yamamoto<sup>a,\*</sup>, Yukiko Matsui<sup>b</sup>, Toshiki Watanabe<sup>a</sup>, Koji Nakanishi<sup>a</sup>,*

*Tomoki Uchiyama<sup>a</sup>, Shoso Shingubara<sup>c</sup>, Masashi Ishikawa<sup>b</sup>, Masayoshi Watanabe<sup>d</sup> and*

*Yoshiharu Uchimoto<sup>a</sup>*

a. Graduate School of Human and Environmental Studies, Kyoto University, Yoshida-nihonmatsu-cho,

Sakyo-ku, Kyoto 606-8501, Japan

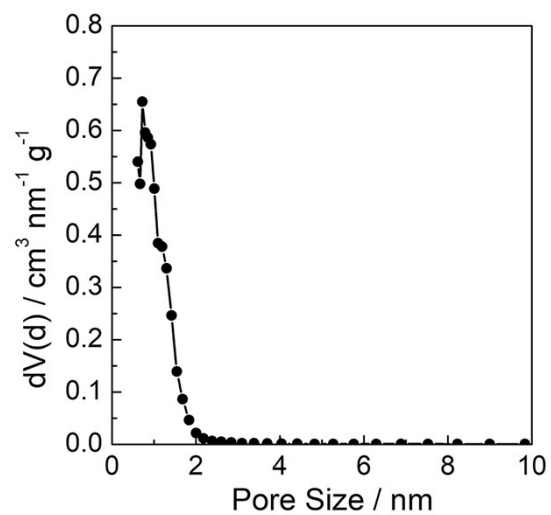
b. Department of Chemistry and Materials Engineering, Kansai University, 3-3-35 Yamate-cho, Suita,

Osaka 564-8680, Japan

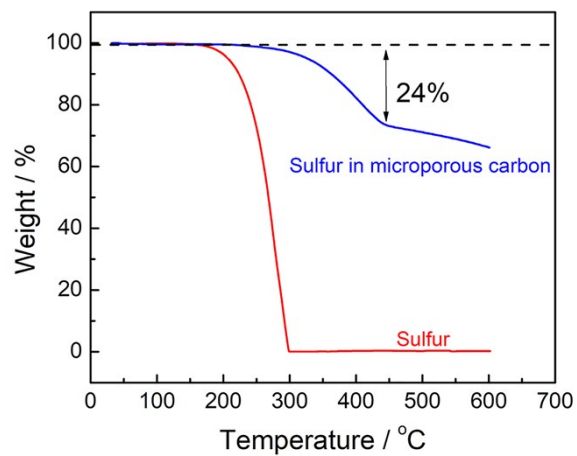
c. Department of Mechanical Engineering, Kansai University, 3-3-35 Yamate-cho, Suita, Osaka 564-8680,

Japan

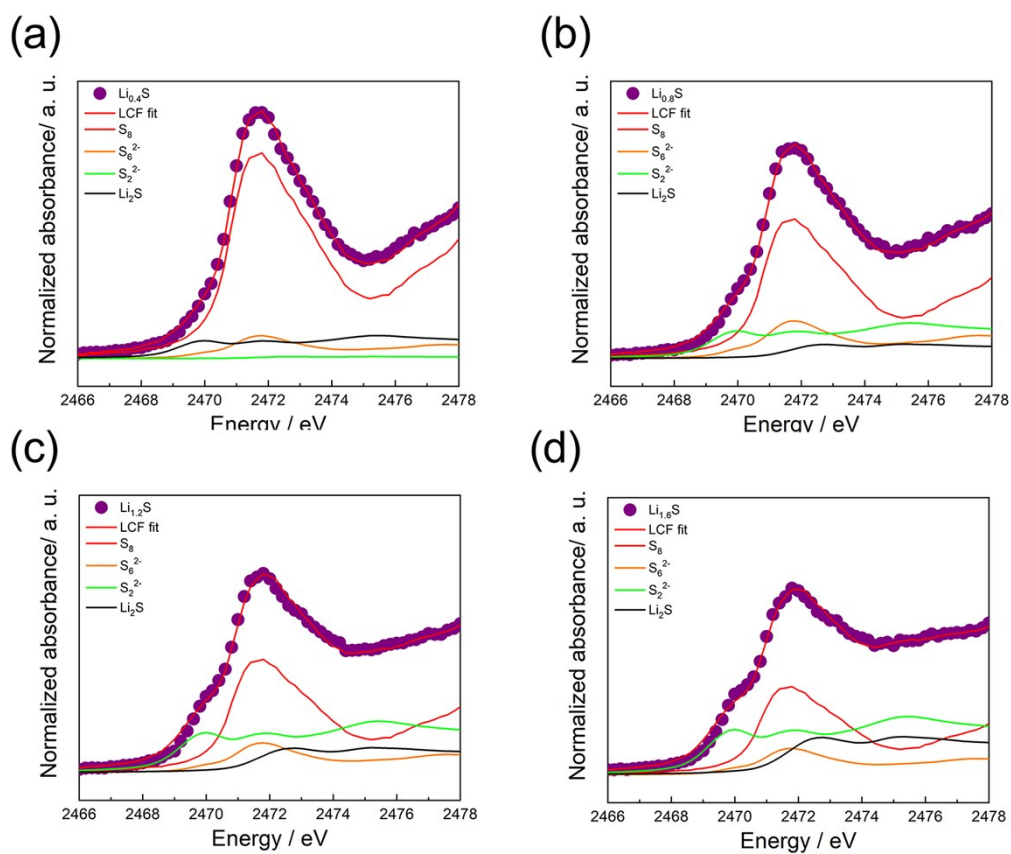
d. Institute of Advanced Sciences, Yokohama National University, 79-5 Tokiwadai, Hodogaya-ku, Yokohama 240-8501, Japan



**Fig. S1.** Pore size distribution of the microporous carbon obtained by  $\text{N}_2$  adsorption isotherm measurement at  $-196\text{ }^\circ\text{C}$ .



**Fig. S2.** Thermogravimetric analysis curves of sulfur and microporous carbon-supported sulfur under an Ar atmosphere at a heating rate of 5 °C/min.



**Fig. S3** Linear combination fitting result of sulfur *K*-edge XANES of microporous carbon-supported sulfur cathode at discharge state of  $\text{Li}_{0.4}\text{S}$ ,  $\text{Li}_{0.8}\text{S}$ ,  $\text{Li}_{1.2}\text{S}$  and  $\text{Li}_{1.6}\text{S}$ .