Investigation of the Impact of Sulfur on the Properties of CZTS Nanomaterials for Enhanced Supercapacitor Performance

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Supporting Information

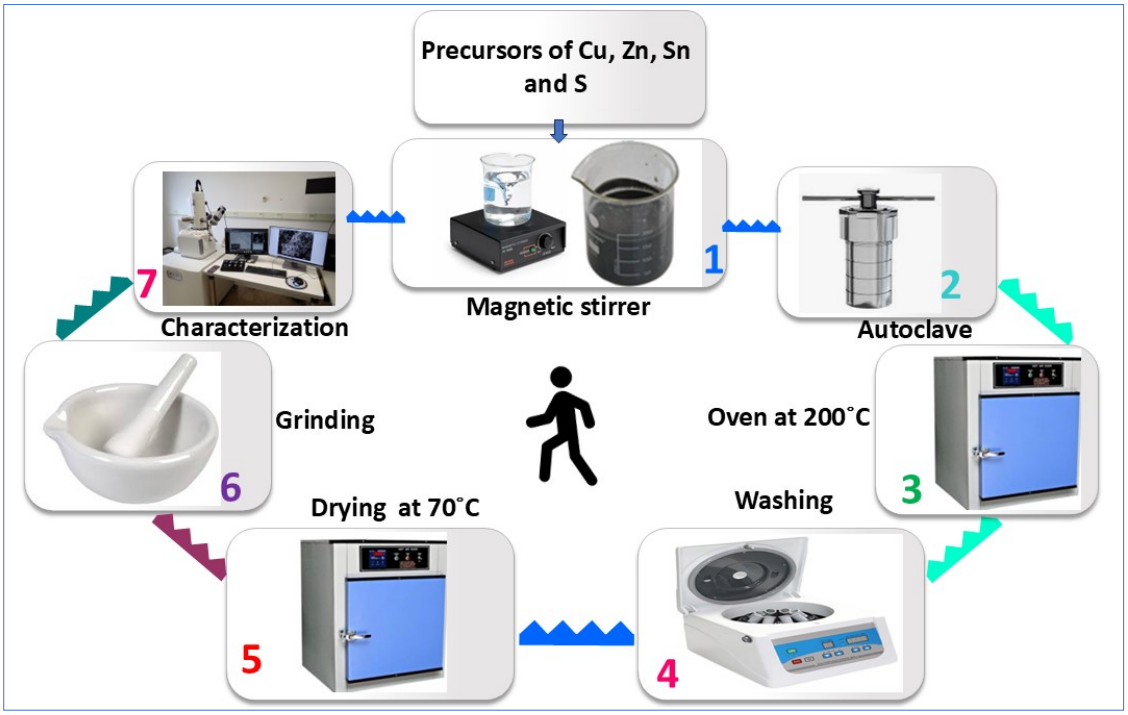

Figure s1. The steps for the synthesis of CZTS nanomaterials are presented.

Sample name	Crystallite size using Scherrer equation	Strain × 10^{-3}	Crystallite size using Williamson-Hall equation	Band gap
CZTS5	22.35 nm	2.82	28.26 nm	1.62 eV
CZTS6	15.75 nm	3.50	20.38 nm	1.66 eV
CZTS7	14.5 nm	7.19	18.23 nm	1.69 eV
CZTS8	11.3 nm	9.41	15.61 nm	1.59 eV

Table S1. Crystallite size (determined through the Scherrer and Williamson-Hall equation), strain, and band gap values of CZTS samples with varying sulphur amounts.

Name	Peak BE	Height CPS	FWHM eV	Area (I) CPS.eV	Atomic %
S 2p	161.31	205290.46	2.96	843645.31	53.36
Sn 3d	485.69	503032.1	2.52	1346131.09	9.05
Cu 2p	931.32	466567.96	2.62	2654798.94	22.70
Zn 2p	1021.13	339791.33	2.73	1828593.71	14.80

Table S2. Atomic %, peak area of the peaks of S 2p, Sn 3d, Cu 2p, and Zn 2p present in CZTS190 sample

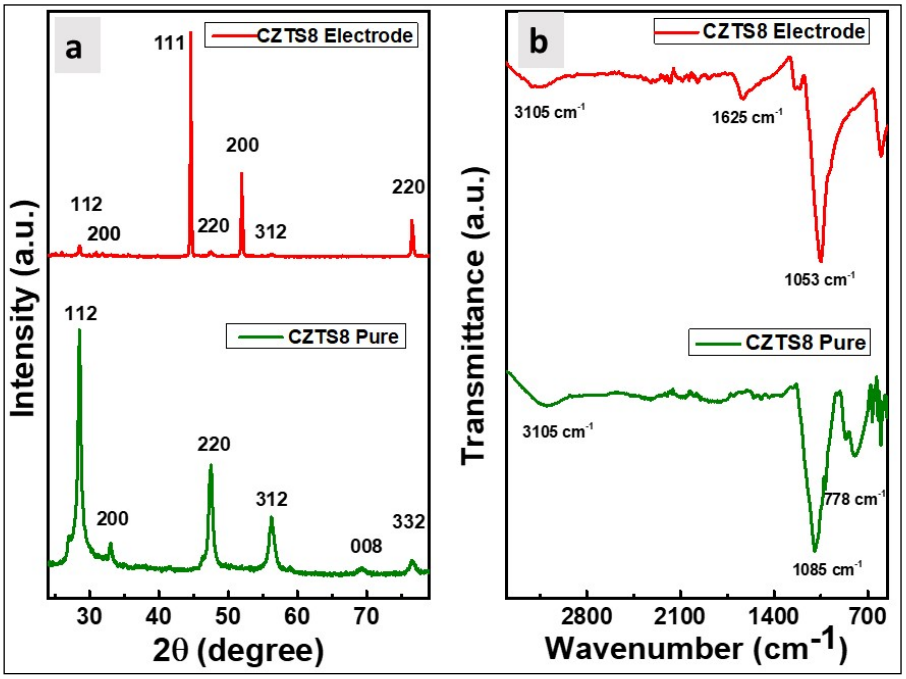

Figure s2. XRD (a), and FTIR (b) of pure CZTS and CZTS electrode.