Supplementary Material

Table S1 comparison table of TCES medium structure, TCES performance with literature

pore structure/S_{BET} (m^2/g)	TCES performance	Cycles	Ref.
11.8	48.26%	20	Our
16.6	49%	10	1
6.5	0.43	20	2
8.2	46%	10	3
13.2	36%	26	4
-	0.33	103	5
-	35%	20	6

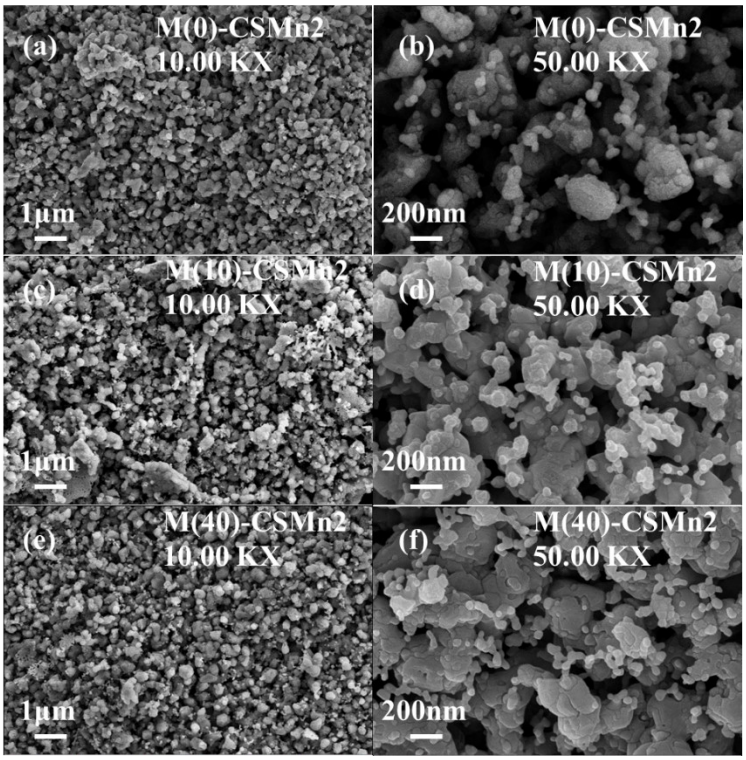

Fig. S1. SEM images of M(0)-CSMn2(a)(b), M(10)-CSMn2(c)(d) and M(40)-CSMn2(e)(f) materials.

Figure S1 shows the scanning electron microscope (SEM) images of the energy storage

materials prepared by adding different proportions of microcrystalline cellulose. Observation of the images shows that with the gradual increase in the addition of microcrystalline cellulose, the particles of the material gradually show an aggregation pattern, and the number of small particles increases. These aggregated small particles restrict the flow of CO_2 molecules to a certain extent, which in turn is not favorable to the chemical reaction between carbon dioxide and calcium oxide. In contrast, the particle distribution of M(0)-CSMn2 shows the loosest state, and this loose particle distribution enables M(0)-CSMn2 to achieve more adequate contact with carbon dioxide molecules, and thus it has achieved the highest energy storage density.

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