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Supplementary Information

for

Novel, Facile, and Scalable Synthesis of Magnesium Based Adsorbent via Freeze-Drying Technique for CO_2 Capture

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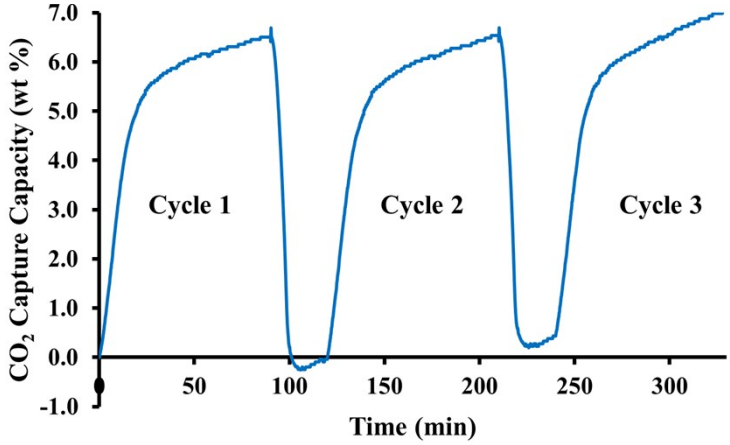
Fig. S1 Photograph of freeze-dried sample displaying white fluffy structure before calcination.

Fig. S2 CO_2 adsorption/desorption cycle curves of FD adsorbent.



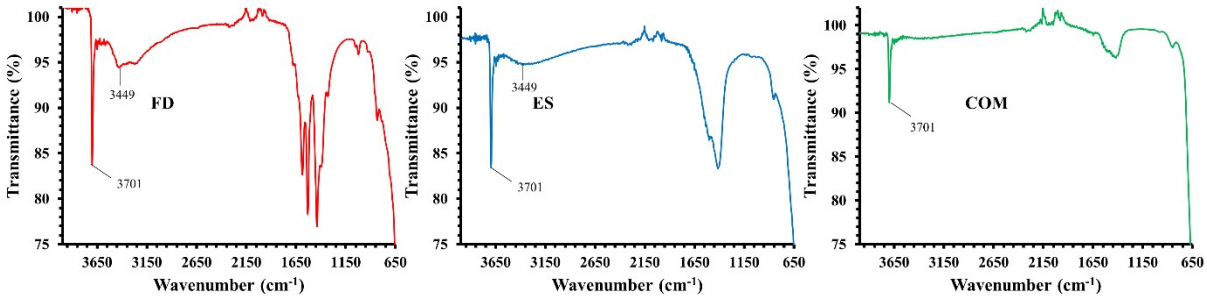


Fig. S3 FTIR spectra of CO_2 adsorbed FD, ES, and COM sorbents within the 650 - 4000 cm^{-1} wavelength range.

Table T1 Comparison of the CO_2 capture capacity (mg/g) of different magnesium oxide/hydroxide-based materials at low adsorption temperatures (≤ 50 °C).

Materials	**Pretreatment desorption temperature (N_2) (°C)**	**CO_2 feed gas concentration (%)**	**CO_2 adsorption temperature (°C)**	**CO_2 capture capacity (mg/g)**	**Reference**
10% Cl^- doped $MgO/Mg(OH)_2$	150	99.9	30	45.9	31
$MgO/Mg(OH)_2$ via ES	150	99.9	30	54.0	This study
$MgO/Mg(OH)_2$ via FD	150	99.9	30	62.0	This study
MgO–MH	400	99.9	50	44.6	16
MgO–BMC	400	99.9	50	57.2	16
MgO–MO	400	99.9	50	60.8	16
MgO400	400	99.9	50	36.9	17
Mesoporous MgO	800	99.9	25	80.0	18
MgO-BM2.5h	850	99.9	25	70.9	28