Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supplementary Information

Freeze-dried MgO nanoparticle foams and their electrical performance in polyethylene

*Love K. H. Pallon[a], Richard T. Olsson[a,] *, Dongming Liu[a], Amir M. Pourrahimi[a], Mikael S. Hedenqvist[a], Anh T. Hoang[b], Stanislaw Gubanski[b], Ulf W. Gedde[a]*

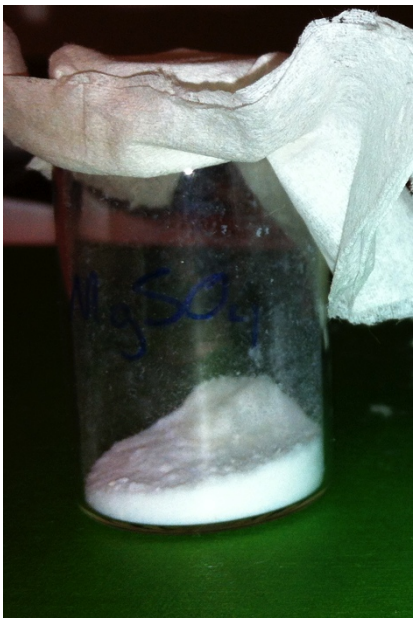
[a] KTH Royal Institute of Technology, School of Chemical Science and Engineering, Fiber and Polymer Technology, SE-100 44 Stockholm, Sweden

[b] Chalmers University of Technology, Department of Materials and Manufacturing Technology, High Voltage Engineering, SE-412 96 Göteborg, Sweden

*Corresponding author: Richard T. Olsson,

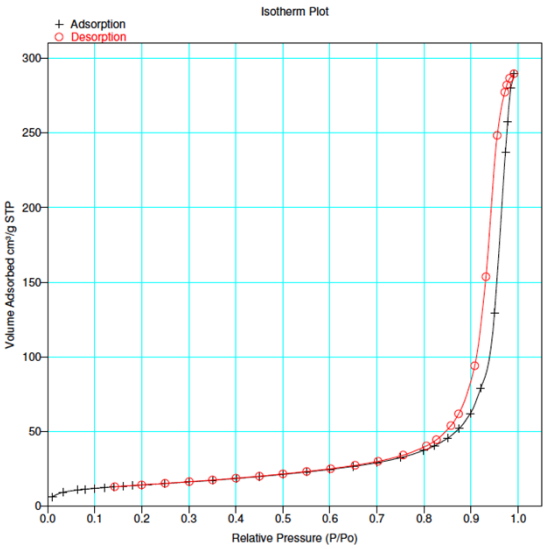
E-mail: rols@kth.se

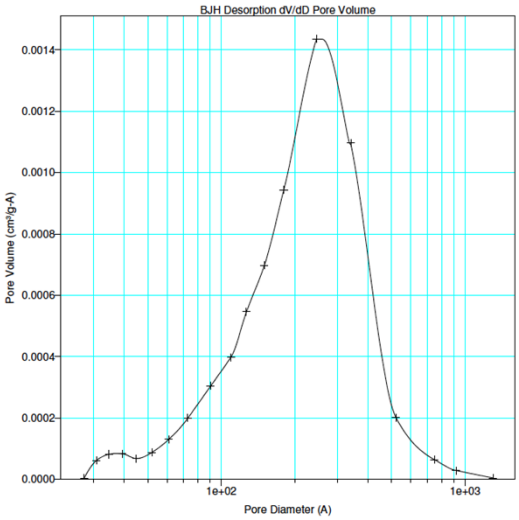
S1- Freeze dried $Mg(OH)_2$ from $MgSO_4$ and NaOH



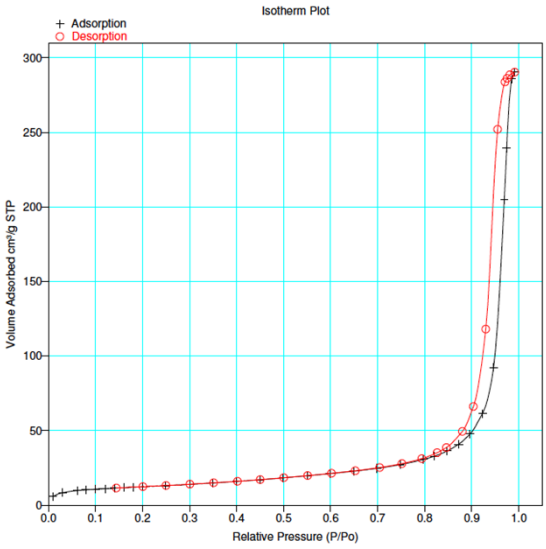
S2 – Nitrogen adsorption data

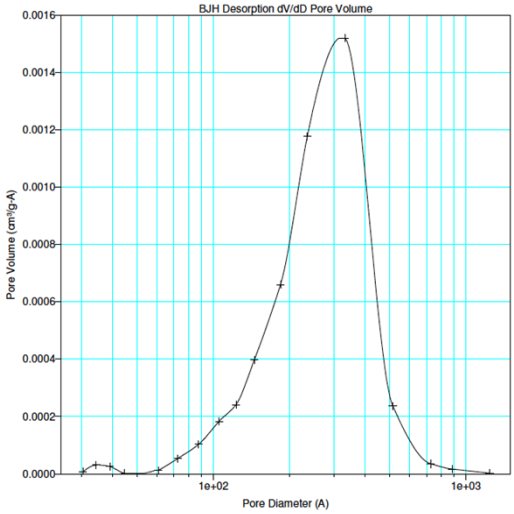
$Mg(OH)_2$ FD



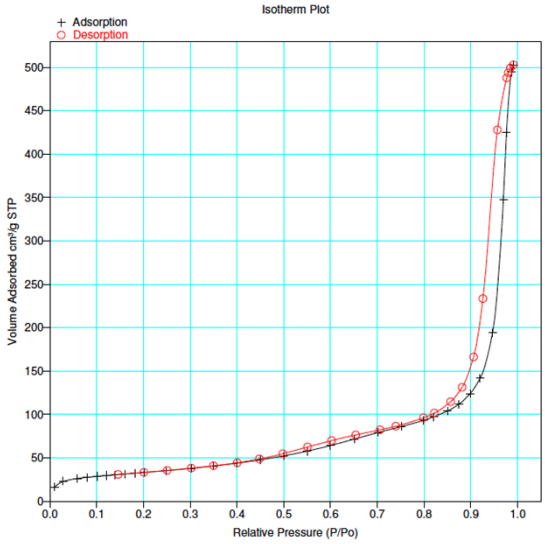


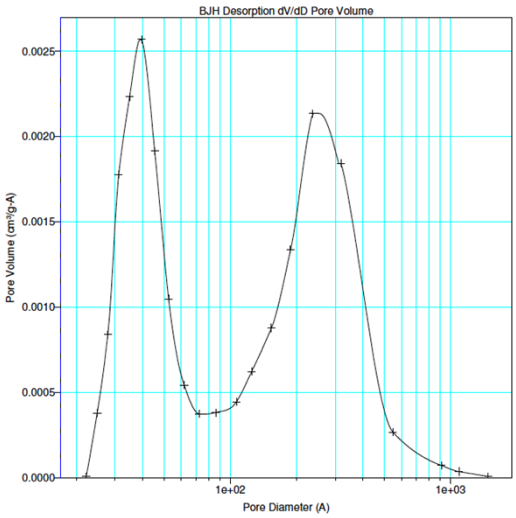
$Mg(OH)_2$ CD



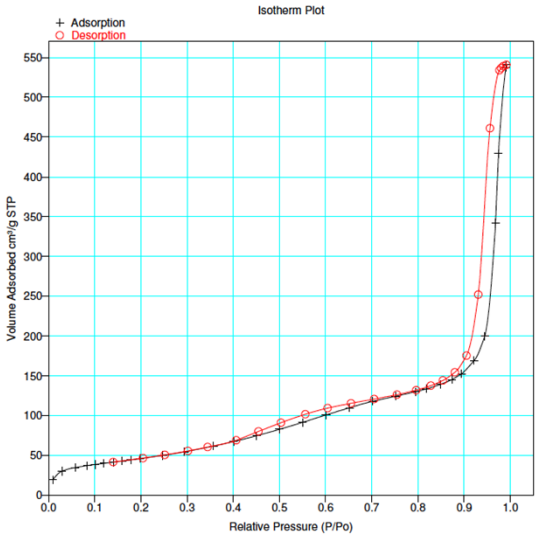


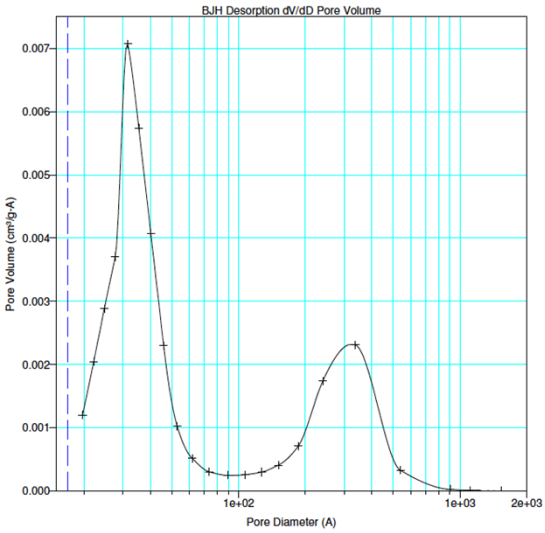
MgO FD


Isotherm Plot
Adsorption
Desorption
Volume Adsorbed cm³/g STP
Relative Pressure (P/Po)


BJH Desorption dV/dD Pore Volume
Pore Volume (cm³/g-A)
Pore Diameter (A)

MgO CD


Isotherm Plot
Adsorption
Desorption
Volume Adsorbed cm³/g STP
Relative Pressure (P/Po)


BJH Desorption dV/dD Pore Volume
Pore Volume (cm³/g-A)
Pore Diameter (A)

S3 – Statistical evaluation of MgO-aggregates on Si-wafer when deposit after dispersion with ultrasonic bath in 2-propanol.

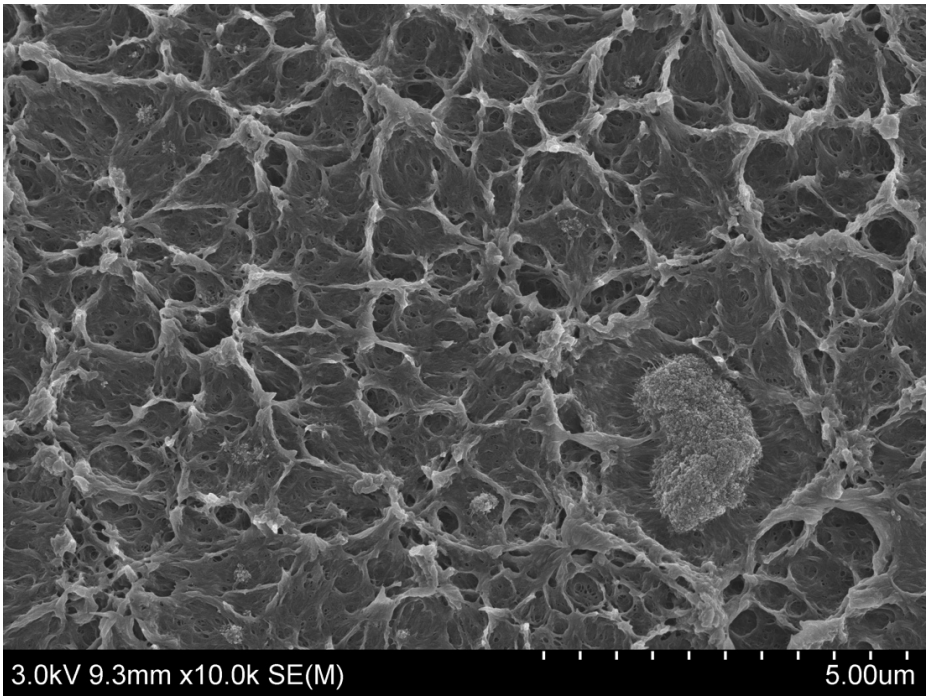
Table S3. Mass-percent of nanoparticle material present as aggregates after ultrasonication

Sample[a]	Ultrasonication time (min)	Number of aggregates[b]	Percent aggregated material[c] [wt.%]
FD-30	30	1435	87
FD-60	60	721	64
FD-120	120	879	50
CD-30	30	352	21
CD-60	60	154	10
CD-120	120	191	10

a) Three sample of each freeze-dried (FD) and conventional dried (CD), where the number is the time of ultrasonication. b) The number of aggregates is normalized with respect to the size of the Si-wafer. c) Based on micrographs the aggregates density is assumed to be 1790 kg m^{-3}, which is half the density of bulk MgO.

S4 – Micrographs of LDPE/MgO extruded at 115 °C for 6 min.

MgO FD – At 115 °C, the MgO tends to release fewer solitary particles with more remaining aggregates.



MgO CD – Micrograph of LDPE/CD extruded at 115 °C and 6 minutes.