Interface-enhanced Li ion conduction in $LiBH_4$-SiO_2 solid electrolyte

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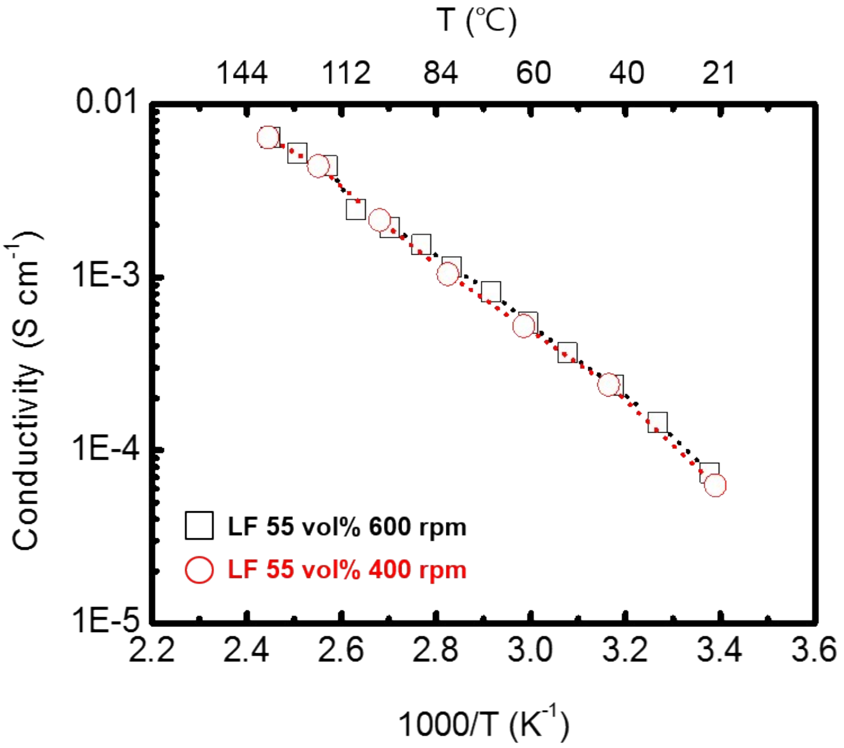

Figure S1. Arrhenius plots of the ionic conductivities of ball-milled LF 55 vol.% sample at 600 rpm and 400 rpm.

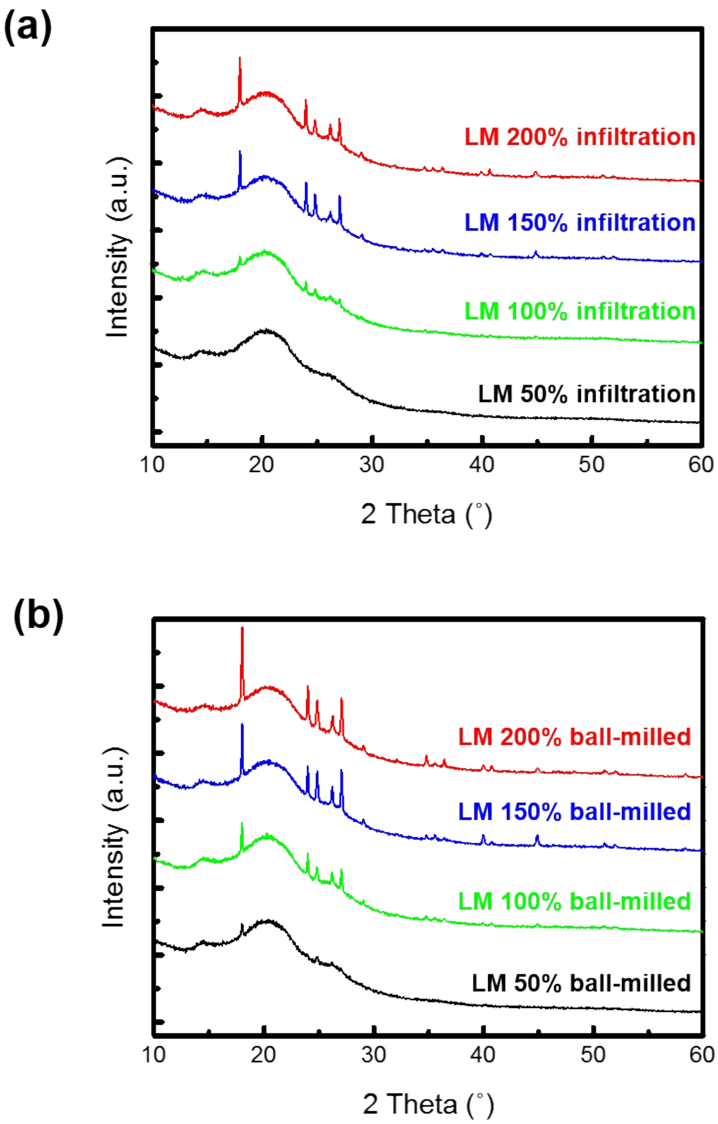

Figure S2. X-ray diffraction patterns of (a) infiltrated and (b) ball-milled LM composites in different mixing ratios.

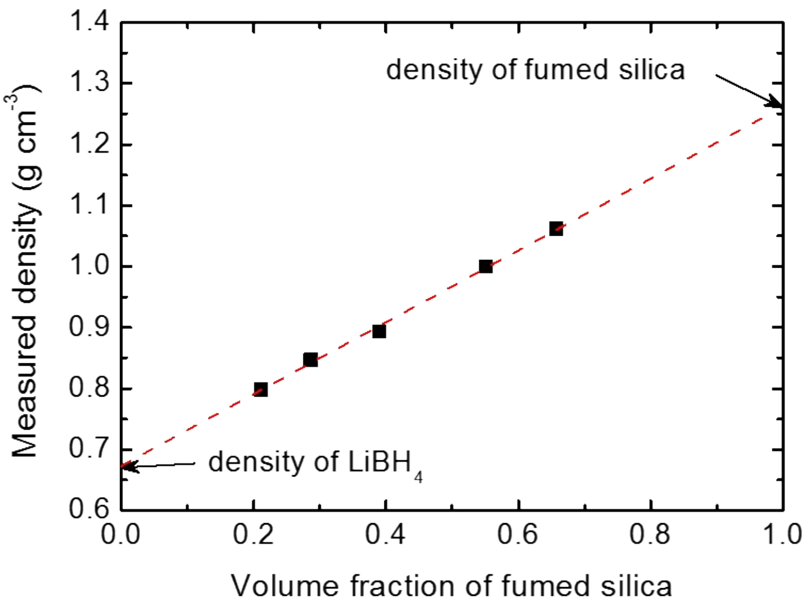

Figure S3. Starting from the initial densities of $LiBH_4$ and fumed silica of 0.61 and 1.24 g cm^{-3}, respectively, an iterative procedure was applied to adjust the reference densities. At each iteration, volume fractions were calculated using the input densities and a linear regression was performed for the measured density vs. volume fraction plot. The densities at $x = 0$ and $x = 1$ correspond to the output density of $LiBH_4$ and fumed silica, respectively. The procedure was repeated until the input and output densities become identical. The results were converged after four runs, and the graph shows the values at the fourth run. The 77 vol.% data point was excluded in the fitting procedure.

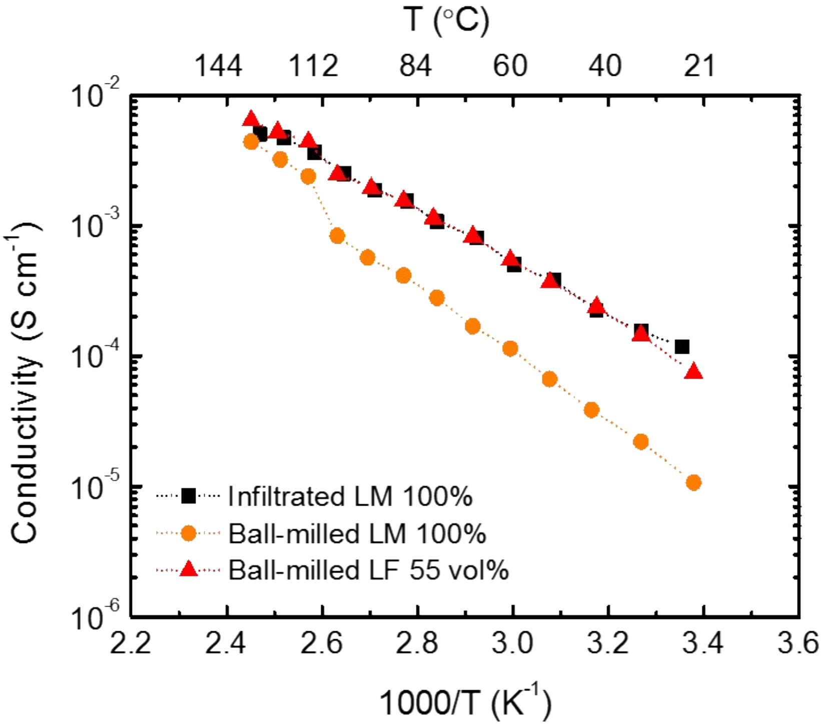

Figure S4. Comparison of the ionic conductivities of LM and LF mixture which exhibits the maximum conductivity among each set of mixtures.

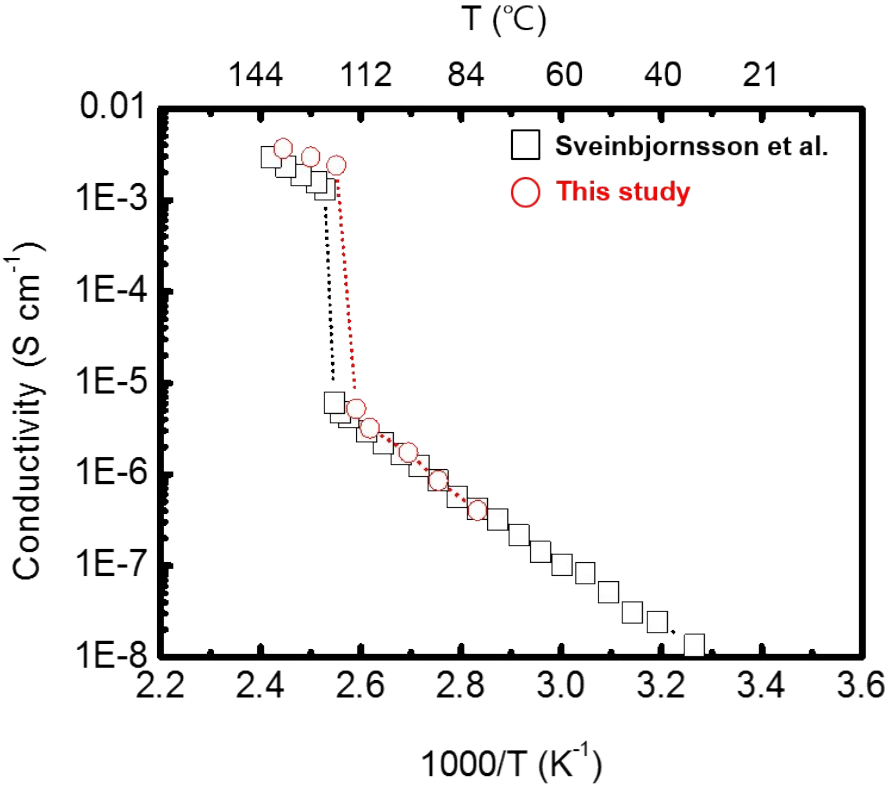

Figure S5. Comparison of the ionic conductivities of pure $LiBH_4$ in this study and by Sveinbjörnsson et al. (Ref. [40] in the main text)

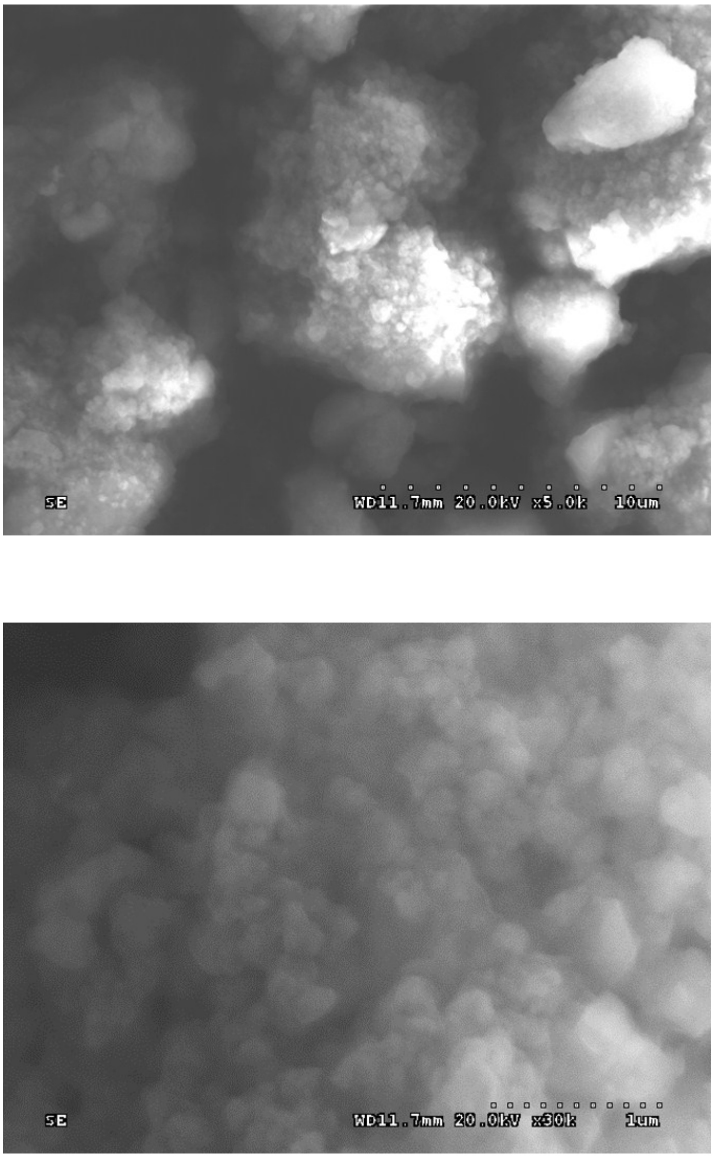

Figure S6. SEM images of ball-milled MCM-41.

Table S1. Summary of wt.% and vol.% of SiO_2 in the LM or LF mixtures used in the present study. The number in the parenthesis has relatively large uncertainty.

Infiltrated LM mixtures

Pore volume %	200	150	100	50
wt% SiO_2	43.9	52.1	61.0	75.8

Ball-milled LM mixtures

Pore volume %	200	150	100	50
wt% SiO_2	43.9	52.1	61.0	75.8
vol% SiO_2	26.6	33.6	42.1	59.2

Ball-milled LF mixtures

wt% SiO_2	33.3	42.9	54.5	69.7	78.3	86.2
vol% SiO_2	21.1	28.6	39.0	55.1	65.8	(76.9)