Cost-Effective 1T-MoS_2 Grown on Graphite Cathode Materials for High-Temperature Rechargeable Aluminum Ion Batteries and Hydrogen Evolution in Water Splitting

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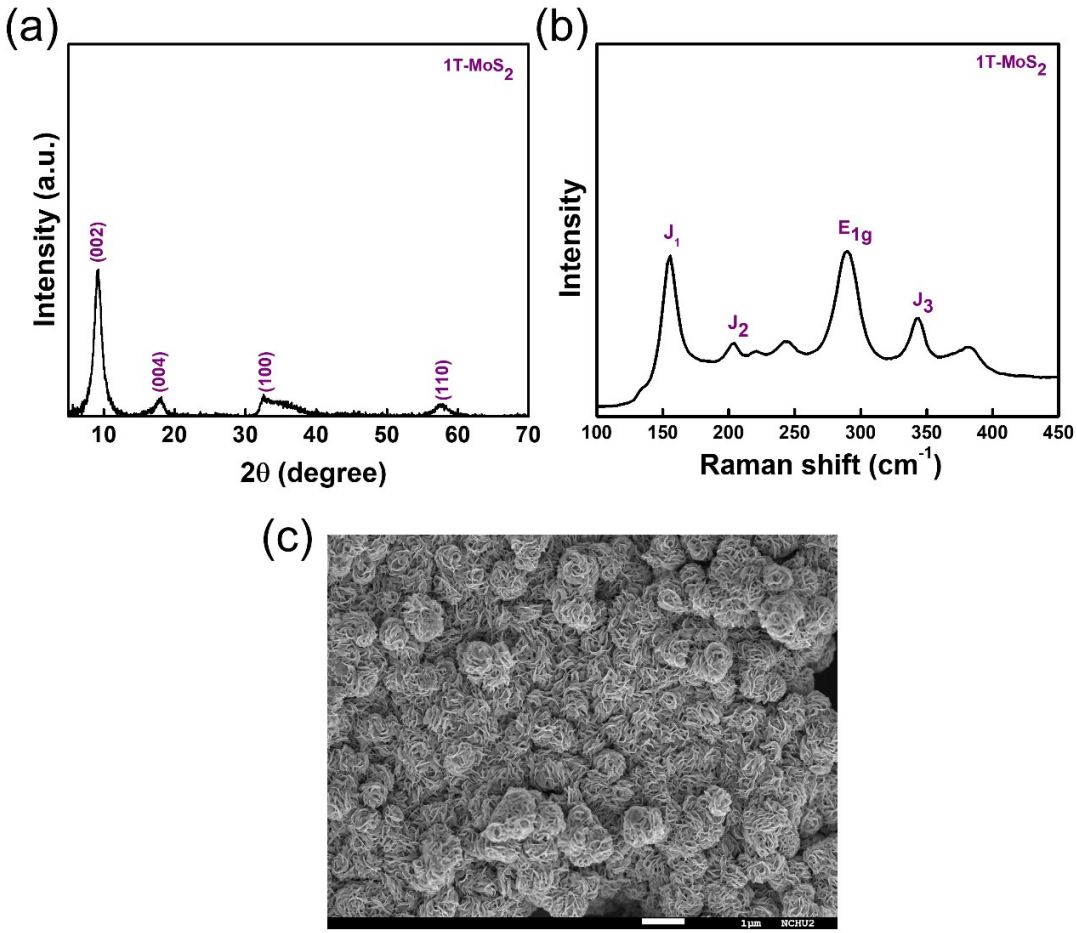

Figure S1: (a-c) XRD, Raman and FESEM image of 1T-MoS_2, respectively.

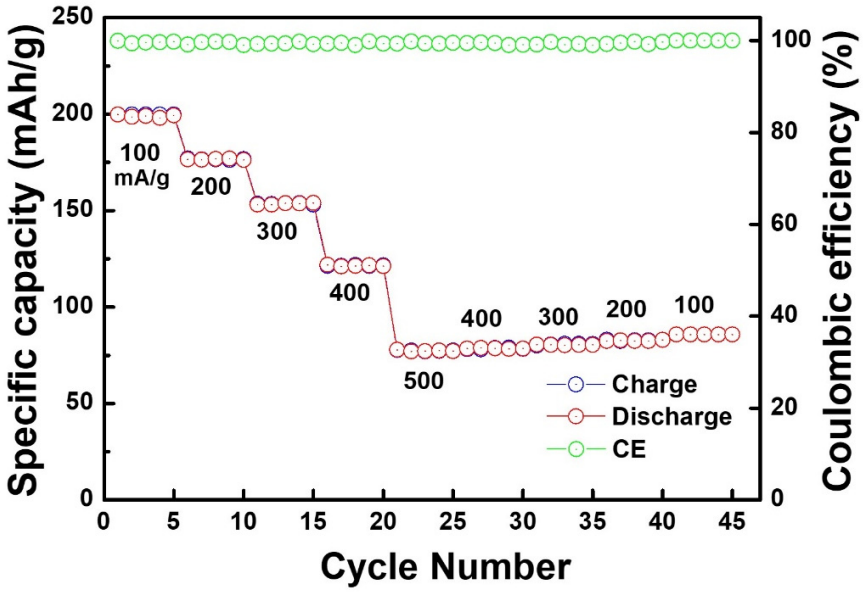

Figure S2: Rate capability of 1T-MoS_2-urea at 60 °C.

Table S1: A comparison table comprising of different cathodes have been compared with respect to cost of electrolyte and performance.

Cathode	**Electrolyte**	**Price (USD/kg)**	**Temp °C**	**Capacity @ rate (mAh/g @ mA/g)**	**Cycle**	**Ref.**
1T-MoS_2/SP-1	**Urea-$AlCl_3$**	**587**	**60 RT**	**200 @ 100 105 @ 100**	**100 100**	**Present work**
MoS_2 - CNF	EMIC-$AlCl_3$	8071	RT	130 @ 100	200	[1]
MoS_2 - MS	EMIC-$AlCl_3$	8071	RT	58.5 @ 100	150	[2]
MoS_2 - MS	EMIC-$AlCl_3$	8071	RT	66.7 @ 40	100	[3]
MoS_2-MXene	EMIC-$AlCl_3$	8071	RT	166 @ 88	60	[4]
SnS	EMIC-$AlCl_3$	8071	RT	370 @ 20	100	[5]
$CoSe_2$/C/rGO	EMIC-$AlCl_3$	8071	RT	143 @ 1000	500	[6]
TeO_2 - MW	EMIC-$AlCl_3$	8071	RT	152 @ 200	150	[7]
Cu_3P/C	EMIC-$AlCl_3$	8071	RT	17 @ 50	50	[8]
$Ni_{11}(HPO_3)_8(OH)_6$/ rGO	EMIC-$AlCl_3$	8071	RT	49 @ 200	1500	[9]
Graphite	Urea-$AlCl_3$	587	RT	87 @ 100	180	[10]
TPB	Urea-$AlCl_3$	587	RT	175 @ 100	250	[11]
Flexuous graphite	EMIC-$AlCl_3$	8071	RT	142 @ 3000	8000	[12]

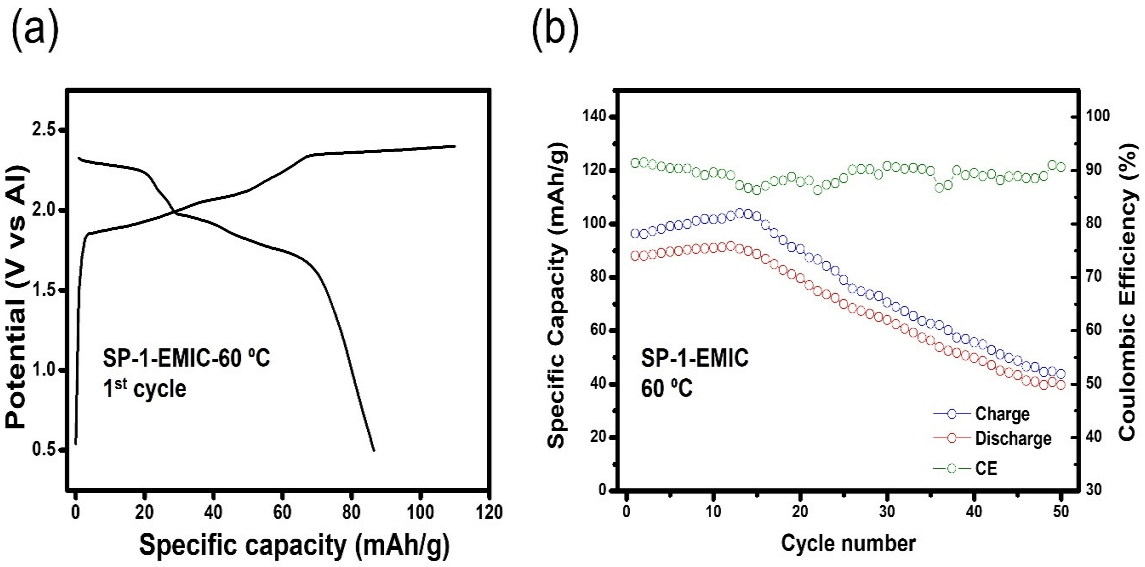

Figure S3: (a) Charge-discharge profile and (b) Cycling performance of SP-1- EMIC at 60 ºC.

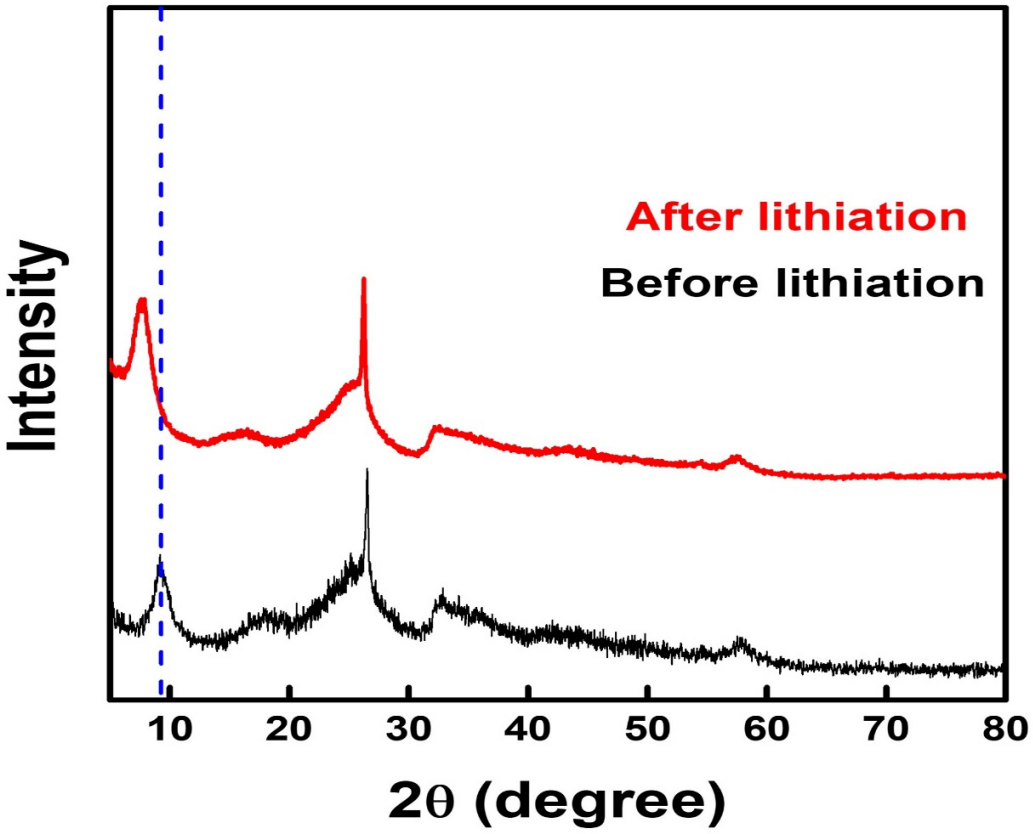

Figure S4: XRD patterns of 1T-MoS_2/SP-1 before and after lithiation.

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