

Supporting Information

**Solution-Based Synthesis of Lithium Thiophosphate Superionic Conductors for
Solid-State Batteries: A Chemistry Perspective**

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Tabulation of conductivity values presented in Figure 15 of the main text

Composition	Solvent	Processing Details	σ_{ion} (S·cm ⁻¹)	Reference
80Li ₂ S-20P ₂ S ₅	NMF	Solution processing	2.6·10 ⁻⁶	1
80Li ₂ S-20P ₂ S ₅	--	Ball milling	2.3·10 ⁻⁴	1
Li ₃ PS ₄	--	Extrapolated from high-temp. phase	8.93·10 ⁻⁷	2
Li ₃ PS ₄	THF	Solution synthesis	1.6·10 ⁻⁴	2
Li ₃ PS ₄	NMF / hexane	Solution synthesis	2.3·10 ⁻⁶	3
Li ₃ PS ₄	ACN	Solution synthesis	1.2·10 ⁻⁴	4
Li ₃ PS ₄	EP	Solvo-mechanical	2.0·10 ⁻⁴	5
Li ₃ PS ₄	DMC	Solvo-mechanical	6.0·10 ⁻⁶	6
Li ₃ PS ₄	EA	Solvo-mechanical	2.0·10 ⁻⁴	6
Li ₃ PS ₄	MPK	Solvo-mechanical	3.0·10 ⁻⁷	6
Li ₃ PS ₄	DMC	Solvo-mechanical	3.3·10 ⁻⁴	7
Li ₇ P ₃ S ₁₁	DME	Solution synthesis	2.7·10 ⁻⁴	8
Li ₇ P ₃ S ₁₁	--	High temp. synthesis	4.1·10 ⁻³	9
Li ₇ P ₃ S ₁₁	ACN	Solution synthesis	1.0·10 ⁻³	10
Li ₇ P ₃ S ₁₁	ACN	Solution synthesis	8.7·10 ⁻⁴	11
Li ₇ P ₃ S ₁₁	ACN	Solution synthesis	9.7·10 ⁻⁴	12
Li ₇ P ₃ S ₁₁	DME	Solvo-mechanical	1.0·10 ⁻⁴	13
Li ₇ PS ₆	1. ACN 2. Ethanol	Solution synthesis	1.1·10 ⁻⁴	14
Li ₇ PS ₆	--	High temp. synthesis	1.6·10 ⁻⁶	15
Li ₆ PS ₅ Cl	Ethanol	Solution processing	1.4·10 ⁻⁵	16
Li ₆ PS ₅ Cl	--	Ball milling	1.4·10 ⁻³	16
Li ₆ PS ₅ Cl	Ethanol	Solution processing	3.0·10 ⁻⁴	17
Li ₆ PS ₅ Cl	1. THF 2. Ethanol	Solution synthesis	2.4·10 ⁻³	18
Li ₆ PS ₅ Cl	Ethanol	Solution processing	1.4·10 ⁻⁵	19
Li ₆ PS ₅ Cl	--	Ball milling	9.5·10 ⁻⁴	19
Li ₆ PS ₅ Cl	--	High temp. synthesis	1.97·10 ⁻³	20
Li ₆ PS ₅ Br	1. THF 2. Ethanol	Solution synthesis	1.4·10 ⁻³	21
Li ₆ PS ₅ Br	MC	Ball milling	1.2·10 ⁻³	21
Li ₆ PS ₅ Br	1. THF 2. Ethanol	Solution synthesis	1.9·10 ⁻³	18
Li ₆ PS ₅ Br	Ethanol	Solution processing	5.5·10 ⁻⁵	19
Li ₆ PS ₅ Br	--	Ball milling	8.2·10 ⁻⁴	19
Li ₆ PS ₅ Br	--	High temp. synthesis	1.12·10 ⁻³	20
Li ₆ PS ₅ I	1. THF 2. Ethanol	Solution synthesis	2.0·10 ⁻⁶	18
Li ₆ PS ₅ I	Ethanol	Solution processing	1.9·10 ⁻⁵	19
Li ₆ PS ₅ I	--	Ball milling	3.7·10 ⁻⁴	19
Li ₆ PS ₅ I	--	High temp. synthesis	1.0·10 ⁻⁶	20

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