Electronic Supporting Information

for

Time and energy conserving solution combustion synthesis of nano $Li_{1.2}Ni_{0.13}Co_{0.13}Mn_{0.54}O_2$ cathode material and its performance in Li-ion batteries

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Electronic Supporting information Table - S1. Relevant thermodynamics data.

Compound	ΔH_f (KJ mol^{-1})
$LiNO_{3(c)}$	579.72
$Ni(NO_3)_2$-$6H_2O_{(c)}$	539.63
$Co(NO_3)_2$-$6H_2O_{(c)}$	54.66
$Mn(NO_3)_2$-$4H_2O_{(c)}$	311.2
$CO(NH_2)_{2(c)}$	582.92
$C_2H_5NO_{2(c)}$	205.06
$N_{2gc)}$	0
$CO_{2(g)}$	393.5
$H_2O_{(g)}$	241.8
(C)=Crystalline	(g)= Gaseous

Electronic Supporting information Table - S2. pH observations of reaction mixtures before and after the pre heat treatment.

Sl No	Combustion solution	Initial pH of the mixture	pH after heat treatment
1	Urea+ Nitrates solution	5.33	5.94
2	Glycine+ Nitrates solution	3.32	3.27
3	Mixed fuels+ Nitrates solution	3.22	6.74

Electronic Supporting information Table - S3. Structural parameters obtained from two phase rietveld refinement of XRD data for combustion synthesized $Li_{1.2}Ni_{0.13}Mn_{0.54}Co_{0.13}O_2$ heated at 850 °C and lattice parameter for solid state synthesized phase.

Phase 1: $LiNi_{1/3}Co_{1/3}Mn_{1/3}O_2$ ($R\bar{3}m$)					
Element	**Site**	**Wyckoff positions**			**Occupancy**
Li1	**3b**	**0**	**0**	**0**	**0.9800**
Ni1	**3b**	**0**	**0**	**0**	**0.0200**
Li2	**3a**	**0**	**0**	**0.5**	**0.0200**
Ni2	**3a**	**0**	**0**	**0.5**	**0.3100**
Mn1	**3a**	**0**	**0**	**0.5**	**0.3350**
Co1	**3a**	**0**	**0**	**0.5**	**0.3366**
O1	**6c**	**0**	**0**	**0.2440**	**1.0000**
a = 2.8487A° c = 14.2216A°					
Phase 2: Li_2MnO_3 (C2/m)					
Element	**Site**	**Wyckoff positions**			**Occupancy**
Li1	**2b**	**0**	**0.5**	**0**	**0.8516**
Mn1	**2b**	**0**	**0.5**	**0**	**0.1261**
Li2	**2c**	**0**	**0**	**0.5**	**1.0080**
Li3	**4h**	**0**	**0.7149**	**0.5**	**1.1811**
Mn2	**4h**	**0**	**0.6740**	**0.5**	**0.0286**
Li4	**4g**	**0**	**0.0870**	**0**	**0.0840**
Mn3	**4g**	**0**	**0.1795**	**0**	**0.8507**
O1	**6c**	**0.2458**	**0**	**0.2130**	**1.0600**
O2	**8j**	**0.2491**	**0.3281**	**0.2429**	**2.0000**
a = 4.9540A° b = 8.5153A° c = 5.0094A° β = 108.88°					
Rwp = 10.2 Rp = 15.6 Chi 2 = 2.26 Phase ratio 5:5					
Solid –State synthesized phase					
$R\bar{3}m$:- a = b = 2.8453 A°, c = 14.1906 A° C2/m:- a = 4.9680 A°, b = 8.4936 A°, c = 5.0360 A°, β = 110.2 °					

Electronic Supporting information Fig– S1. FESEM image and Powder XRD pattern with Rietveld refinement of solid state synthesized $Li_{1.2}Ni_{0.13}Mn_{0.54}Co_{0.13}O_2$ sample. The XRD pattern shows experimental pattern (red dots), calculated patterns (black lines), the difference curve (pink line) and Bragg diffraction positions (yellow ticks for $R\bar{3}m$ space group and blue ticks for *C 2/m* space group). The inset of figure shows FESEM image.