Electronic Supplementary Material (ESI) for RSC Advances

Novel processing of lithium manganese silicate nanomaterials for Li-ion battery applications

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Supporting Information:

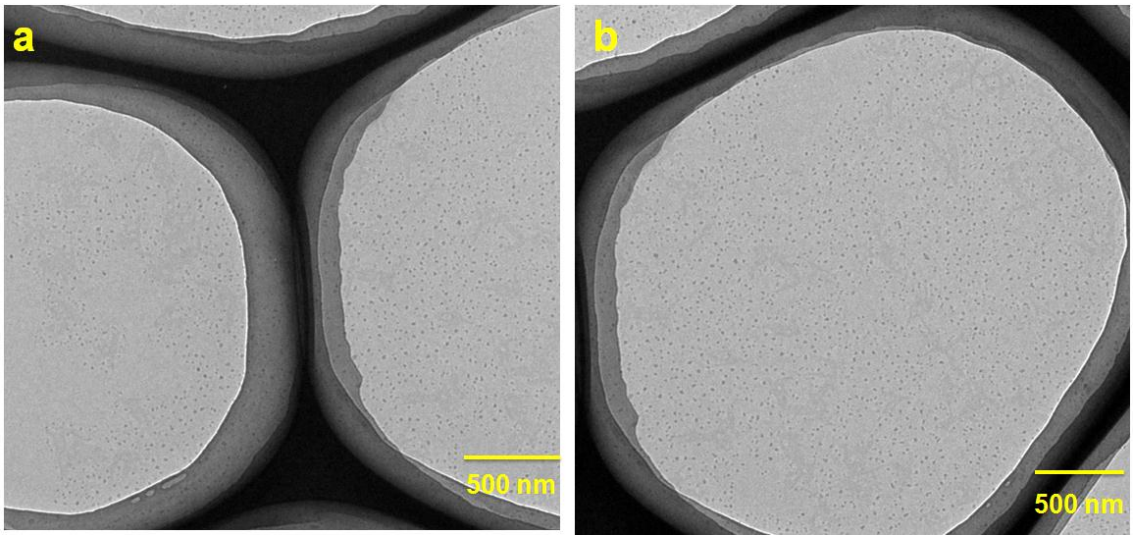

Figure S1. Low magnifications of Li_2MnSiO_4 monodisperse nanoparticles showing homogeneous distribution of uniform size nanoparticles on copper grid.

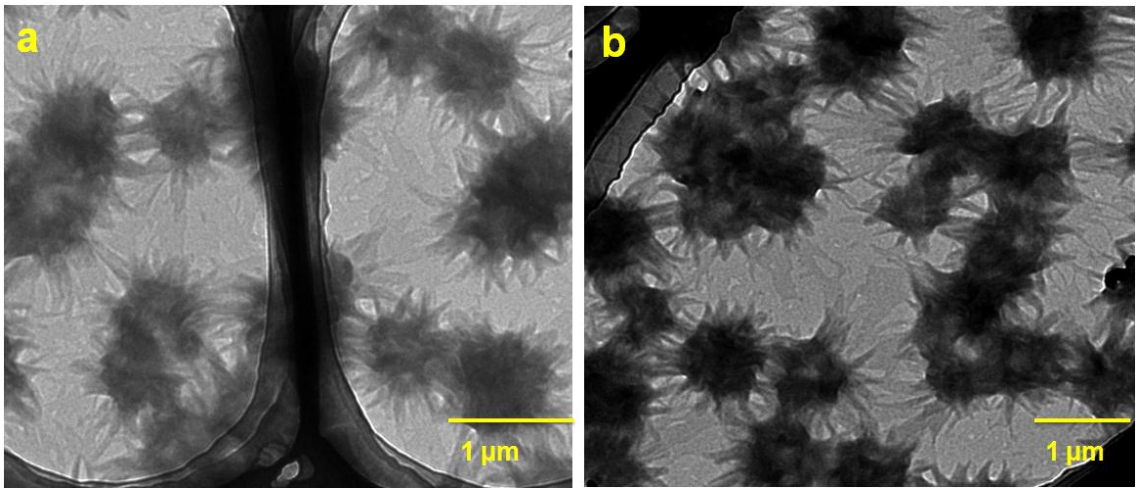

Figure S2. Low magnifications of Li_2MnSiO_4 hierarchical nanostructures showing large number of flower like particles distributed on copper grid.

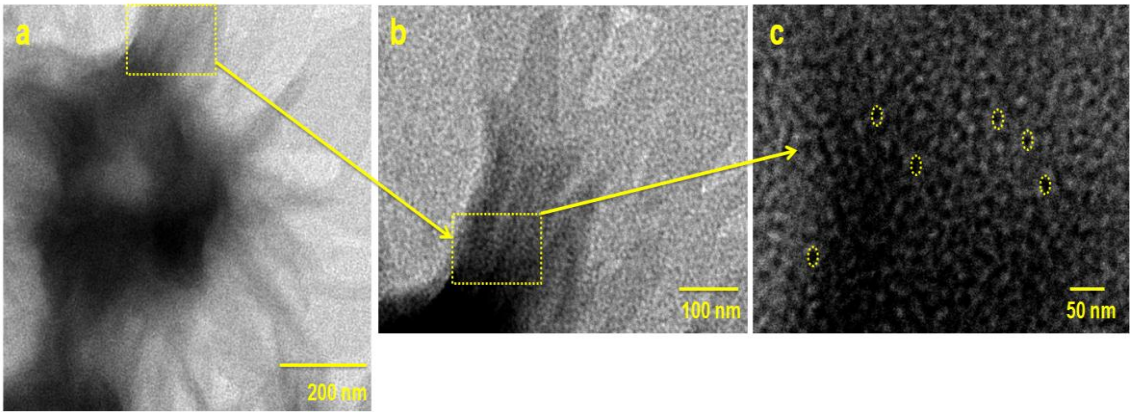

Figure S3. Li_2MnSiO_4 hierarchical nanostructures at different magnifications synthesized via supercritical fluid process (Fig.a-c). The few monodisperse nanoparticles are yellow circled to indicate the presence of nanoparticles to support that hierarchical nanostrucutures are made up of nanoparticles (Fig.c).

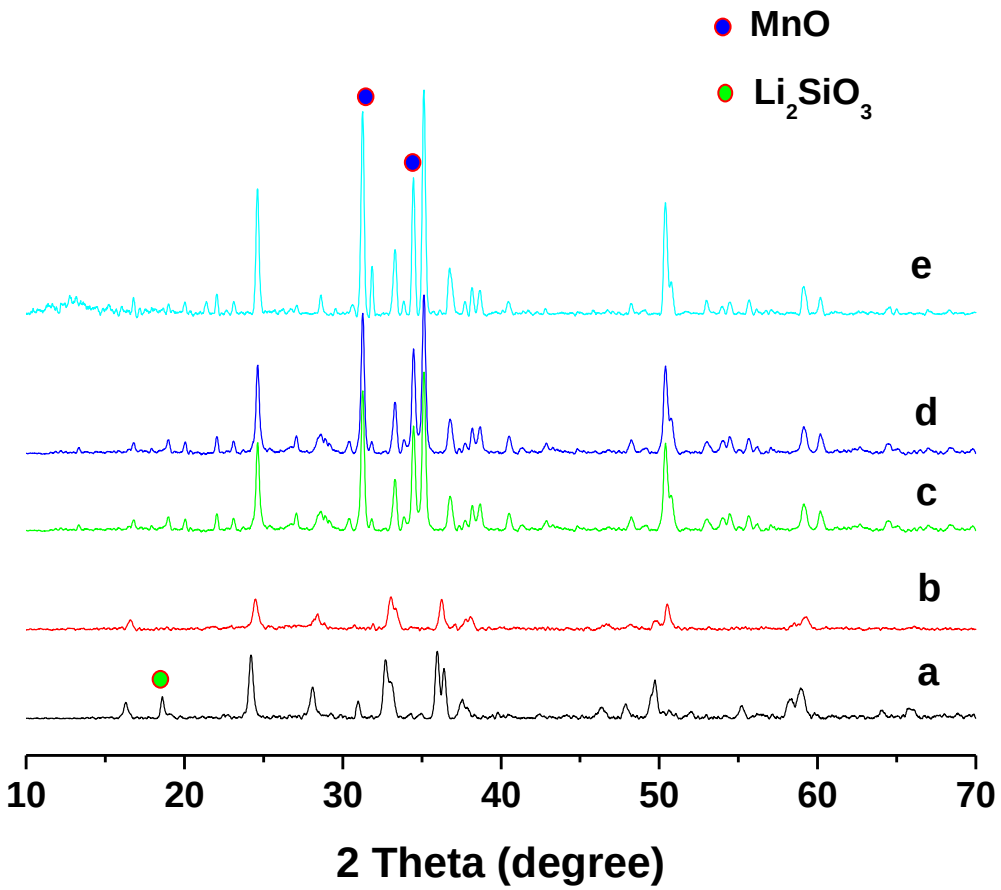

Figure S4. Powder X-ray diffraction (XRD) pattern of Li_2MnSiO_4 cathode materials (a-e). (a) XRD pattern of monodisperse nanoparticles synthesized at 400 ^oC for 4 min, (b) hierarchical nanostrcutures synthesized at 400 ^oC for min by increasing the amount of oleic acid, (c) 30-50 nm size Li_2MnSiO_4 particles synthesized at 400 ^oC for 4 min using oleylamine as surfactant in the presence of water and ethyelene glycol as solvents, (d) 50-70 nm size Li_2MnSiO_4 particles

synthesized at 400 ^{o}C for 4 min using oleylamine as surfactant in the presence of water and diethyelene glycol as solvents, (e) 70-100 nm size Li_2MnSiO_4 particles synthesized at 400 ^{o}C for 30 min using water as solvents and oxalic acid as reducing agent.

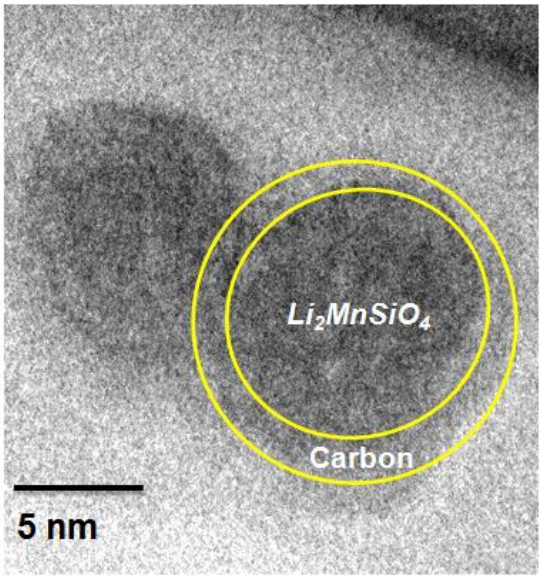

Figure S5. HRTEM image of carbon coated mondisperse Li_2MnSiO_4 nanoparticles showing 2-3 nm of carbon layer around the particles.

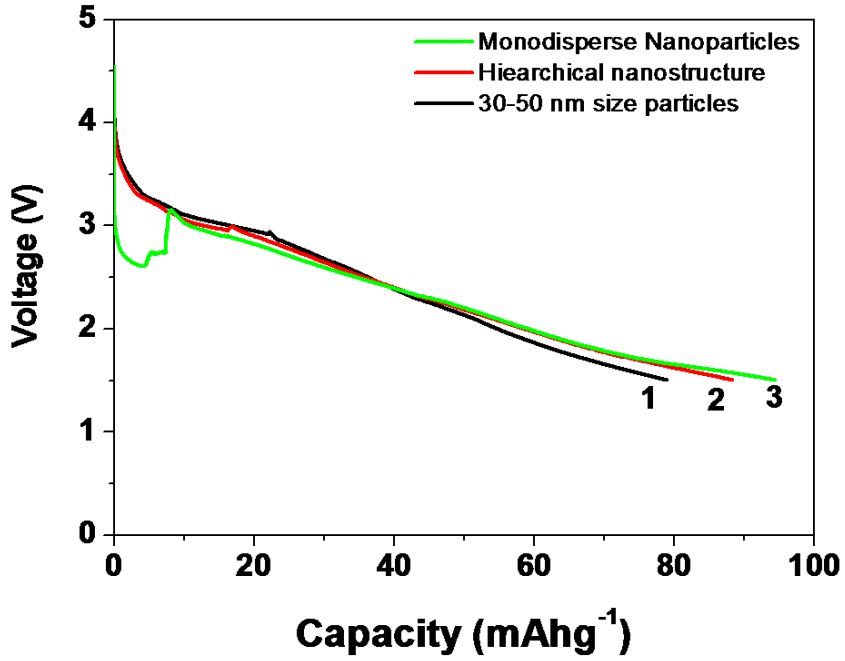

Figure S6. First cycle discharge capacities of as-synthesized monodisperse nanoparticles, hierarchical nanostructure and 30-50 nm size particles showing less capacity before carbon coating.

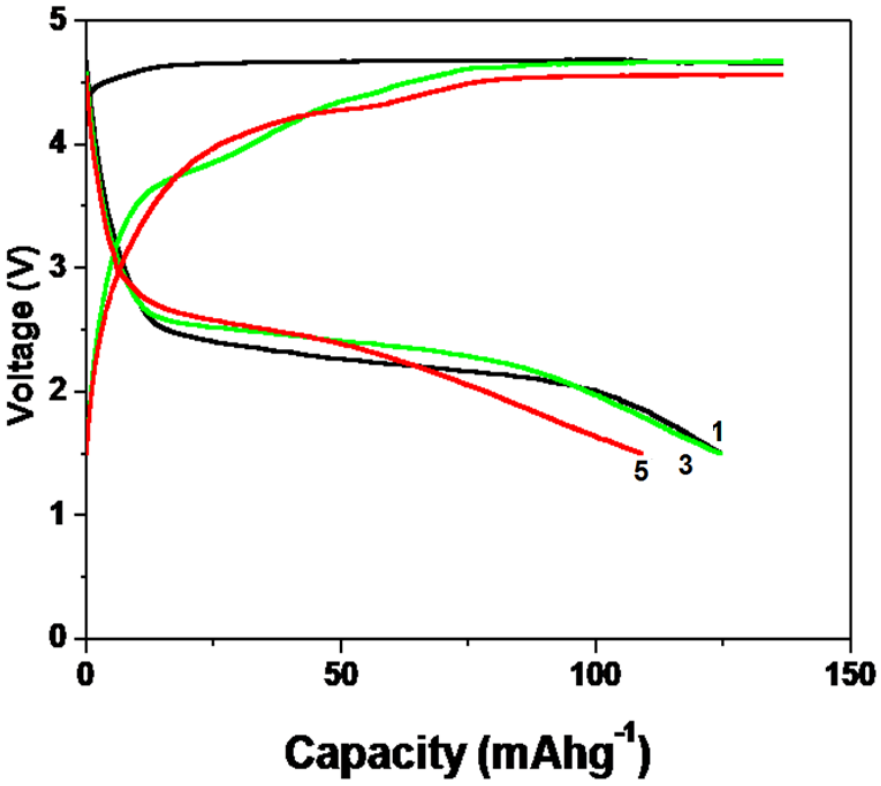

Figure S7. Charge-discharge of 70-100 nm size Li_2MnSiO_4 particles at 0.05 C which was synthesized via supercritical fluid process. The low capacity with flat potential is observed for these particles, which is due to particle size and due to impure phase.

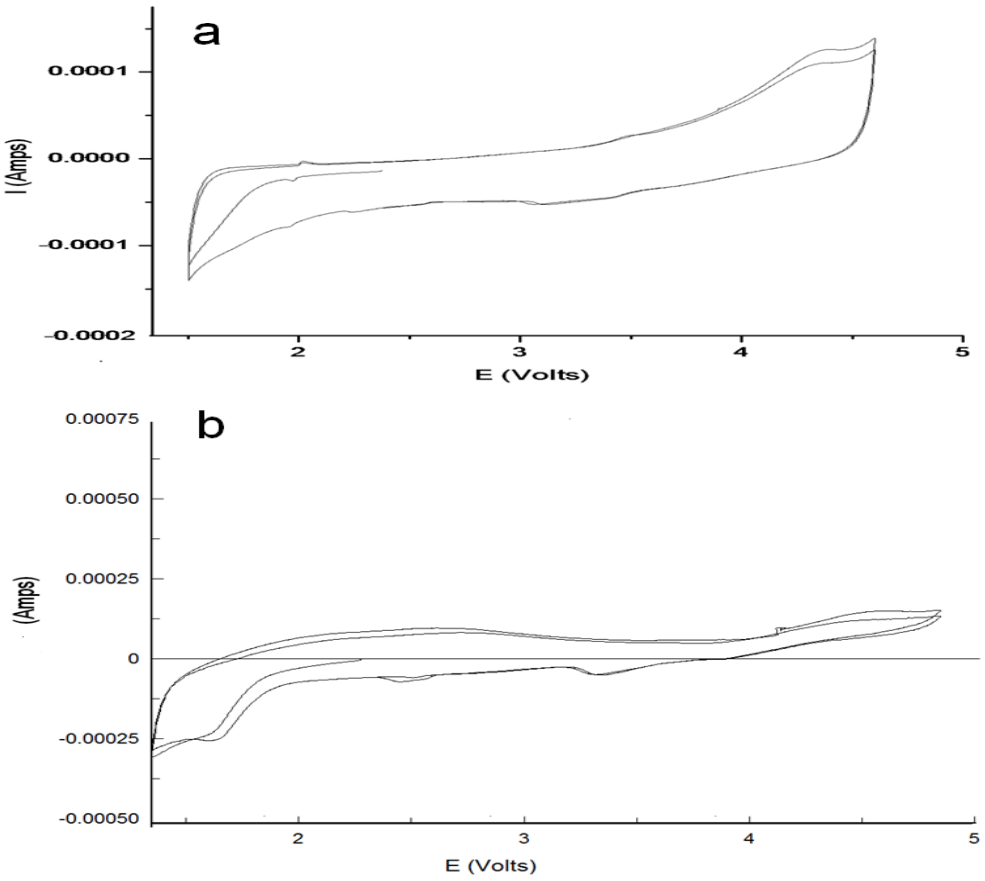

Figure S8. Cyclic voltammetry of monodisperse Li_2MnSiO_4 nanoparticles (a) and hierarchical nanostructures synthesized via supercritical fluid process. The monodisperse nanoparticles and hierarchical nanostructures exhibited pair of redox peaks and hierarchical nanostructures showed much narrow separation than monodisperse nanoparticles indicating better cyclic performance.

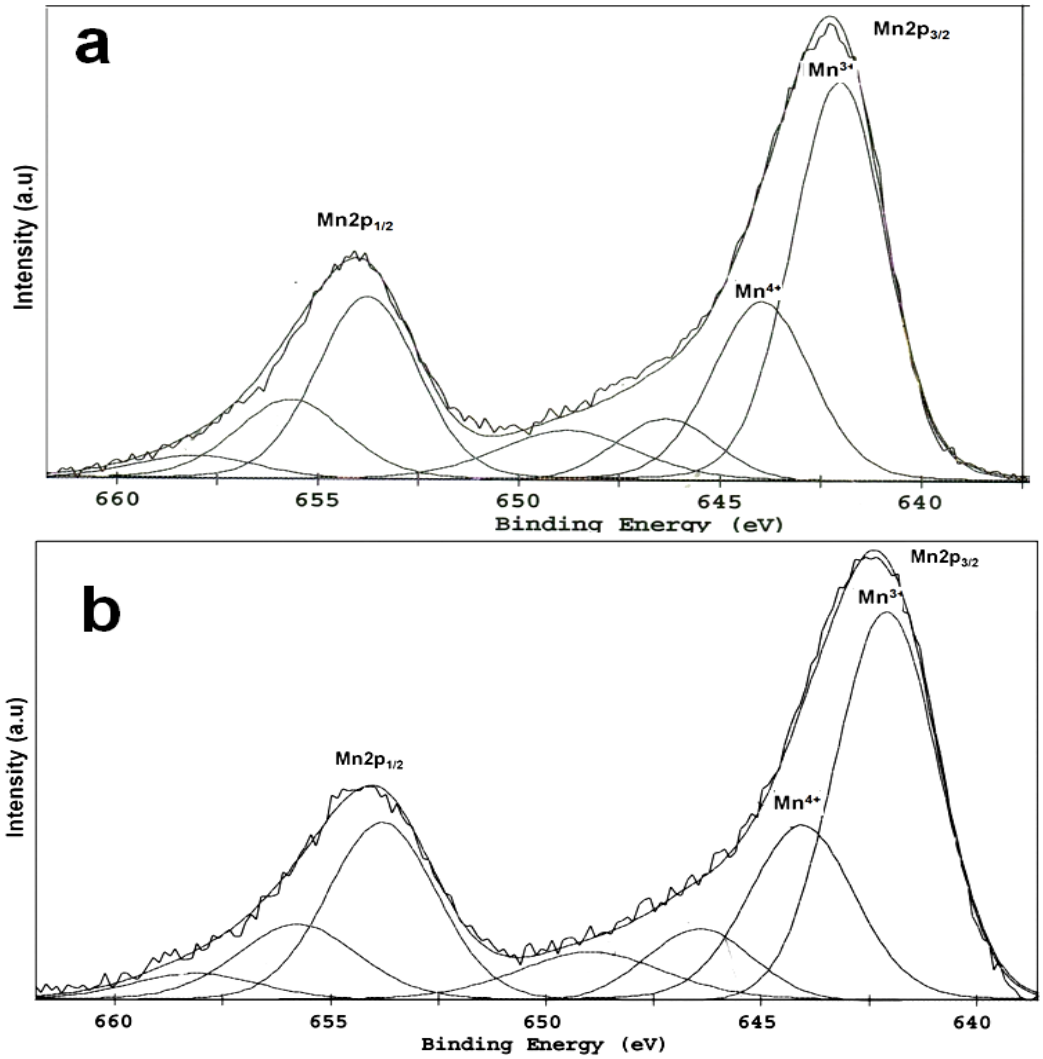

Figure S9. X-ray photoelectron spectroscopy of monodisperse Li_2MnSiO_4 nanoparticles (a) and (b) hierarchical nanostructures synthesized via supercritical fluid process. The monodisperse nanoparticles and hierarchical nanostructures after charging to 4.8 V exhibited presence of Mn^{4+} indicating the possibility of second lithium extraction.