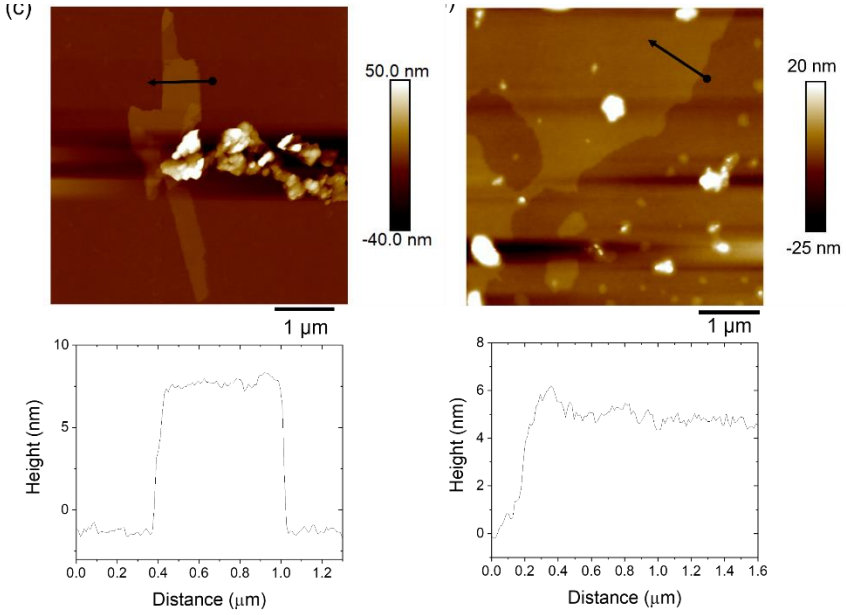
Last Update: 22 March 2023

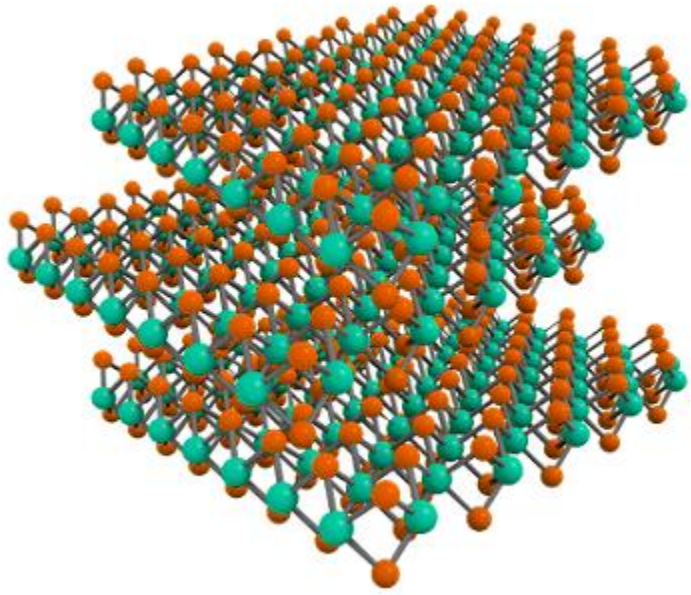
Supercapacitor

MoS2

1. Chemically **exfoliated**-MoS2 (eMoS2) solution
   A. Add 15 mg of MoS2 powder and add it to 30 mL DMF (or NMP) in a tube.
   B. Block the top of it with the paraffin film.
   C. Tip sonication (50 % power) for 1 h.



Plates in the images => exfoliated MoS2.



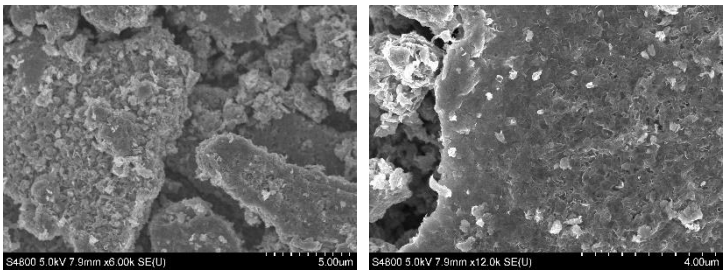
2. Solvothermal-synthesized **defect-free** MoS2 (pMoS2)
   A. Add ~1 mmol **(~36 mg)** hexaammonium heptamolybdate tetrahydrate ((NH4)6Mo7O24·4H2O, HHT, i.e. 7 mmol Mo) and ~14 mmol **(~58 mg)** thiourea

in ~40 mL deionized water.

B. Stirring for 15 min (use magnetic stirring device).

C. Transfer the solution to Teflon-lined stainless steel autoclave (fasten everything tightly).

D. Incubating the solution at 220 C (overnight).



Thick MoS2 plates, yield = ~30 % of Mo source.

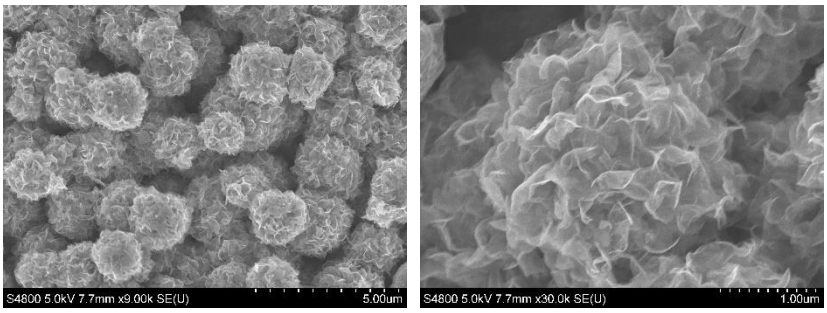
3. Solvothermal-synthesized **defect-rich** MoS2 (nMoS2)

A. Add ~0.9 mmol **(~30 mg)** hexaammonium heptamolybdate tetrahydrate ((NH4)6Mo7O24·4H2O, HHT, i.e. 7 mmol Mo) and ~27 mmol **(~100 mg)** thiourea in ~40 mL deionized water.

B. Stirring for 15 min (use magnetic stirring device).

C. Transfer the solution to Teflon-lined stainless steel autoclave (fasten everything tightly).

D. Incubating the solution at 220 C (overnight).



Carbon nanotube (CNT)-ZIF (Zeolitic imidazole framework)-MoS2

1. CNT

A. Add 5 mg of CNT powder in 30 mL DMF in a tube.

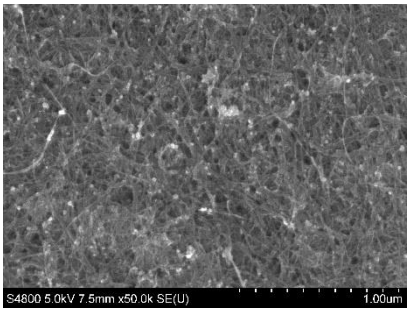
B. Add 30 mg of dopamine hydrochloride in the solution.

C. Block the top of it with the paraffin film.

D. Tip sonication (50 % power) for 30 min.

E. Stirring for 2 h (use magnetic stirring device).

- Dopamine will be coated on CNT. Dopamine layer will act as a precursor for the growth of ZIF.



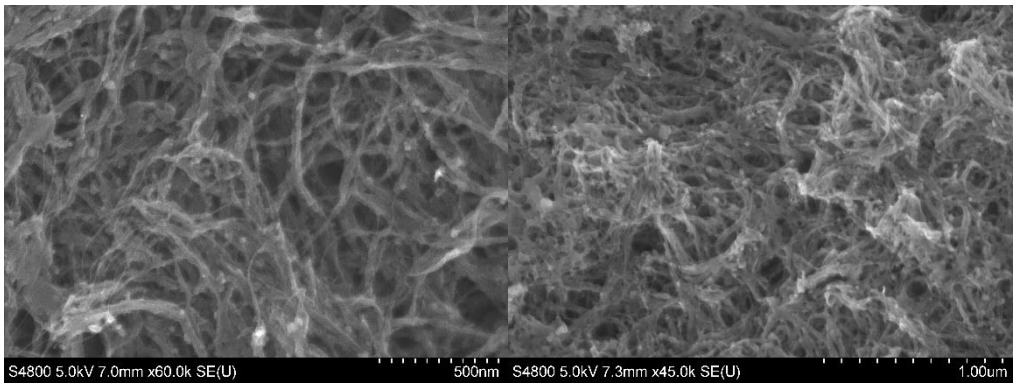
2. CNT-ZIF

A. Add 30 mg of zinc chloride and 15 mg of 1h-1,2,4-triazole-3-thiol in the CNT solution

B. Block the top of it with the paraffin film.

C. Tip sonication (50 % power) for 10 min.

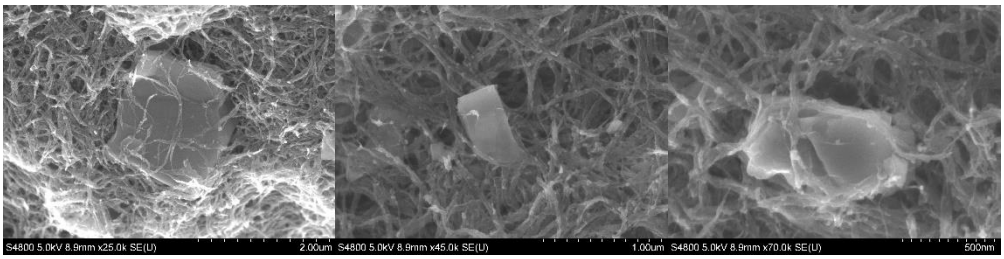
D. Incubating the solution for over 44 h at 120 C.



3. CNT-ZIF-MoS2

A. CNT-ZIF-eMoS2

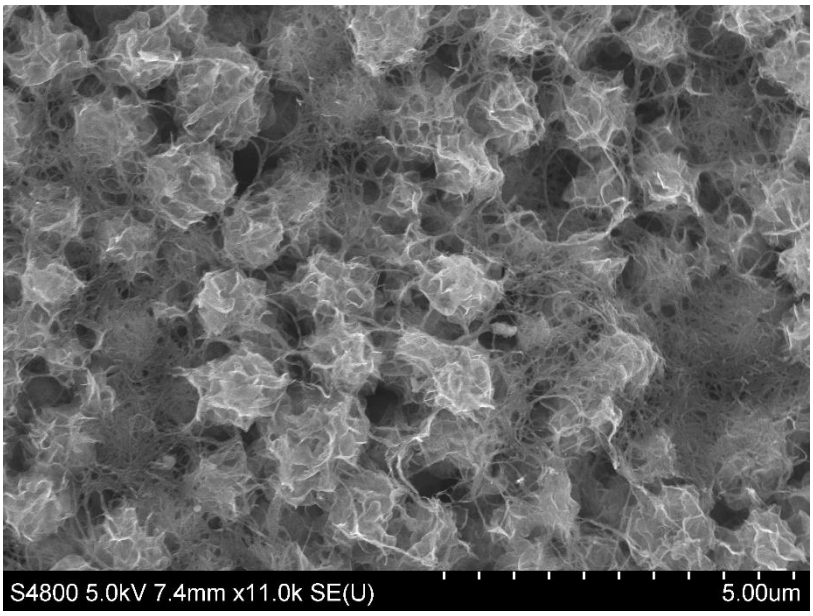
- Add 10 mg of MoS2 in the CNT-ZIF solution
- Tip sonication (50 % power) for 30 min.
- Incubating the solution at 80 C (overnight).



B. CNT-ZIF-nMoS2

- Vacuum-filtrate the CNT-ZIF solution. CNT-ZIF will form a dark film.
- Wash the film with excess amount of EtOH.
- Bake the film at 110 C (overnight).

- Grind the film with glass stick and get CNT-ZIF powder.
- Mix the powder with 0.9 mmol (~30 mg) hexaammonium heptamolybdate tetrahydrate ((NH4)6Mo7O24·4H2O, HHT, i.e. 7 mmol Mo) and 27 mmol (~100 mg) thiourea in ~40 mL deionized water.
- Tip sonication (50 % power) for 30 min.
- Transfer the solution to Teflon-lined stainless steel autoclave (fasten everything tightly).
- Incubating the solution for 24 h at 220 C.



MoS2 nanoflowers are woven with CNT-ZIF network.

yield = 30~40 % of Mo source.

C. CNT-ZIF-pMoS2

- Vacuum-filtrate the CNT-ZIF solution. CNT-ZIF will form a dark film.
- Wash the film with excess amount of EtOH.
- Bake the film at 110 C (overnight).
- Grind the film with glass stick and get CNT-ZIF powder.
- Mix the powder with ~1 mmol (~36 mg) hexaammonium heptamolybdate tetrahydrate ((NH4)6Mo7O24·4H2O, HHT, i.e. 7 mmol Mo) and ~14 mmol (~58 mg) thiourea in ~40 mL deionized water.
- Tip sonication (50 % power) for 30 min.
- Transfer the solution to Teflon-lined stainless steel autoclave (fasten everything tightly).
- Incubating the solution for 24 h at 220 C.

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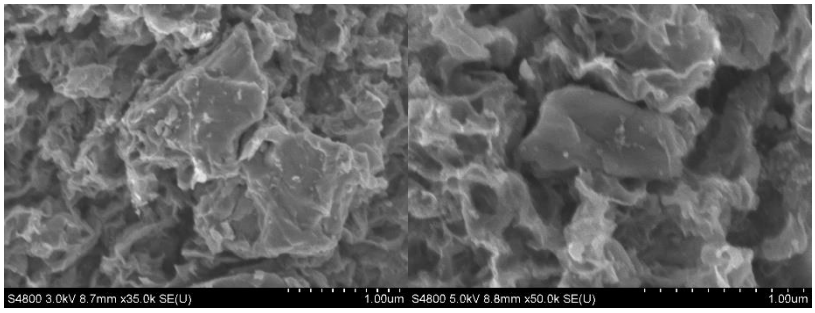

CNT-ZIF fibers are completely packed with MoS2 plates.

MoS2 nanoplate, yield = 30~40 % of Mo source.