

Tape casting of structural positive electrode

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Introduction

Structural battery, as a multifunctional material, has high potential to reduce weight of a electrical devices, such as electrical vehicle and aircraft. To enable multi-funtionality of cathode, carbon fibre is designed to be utilized as both current collector and load carrier.

Aim

Prepare LiFePO_4 coated carbon fibre using tape casting, since tape casting is a cheap and quick method.

Experiment steps

Slurry content

1. LiFePO_4 particles ($< 5 \mu\text{m}$) as active material
2. Carbon black ($< 90 \text{ nm}$) as conductive agent
3. PVDF as binder

The weight ratio is 8:1:1. NMP was used as solvent. The solid content is 20 wt%. The solid content is low because the slurry is casted on carbon fibres and the carbon fibre should also be considered as conductive agent. Combine the weight of carbon fibre, the solid content is much higher than 20 wt%.

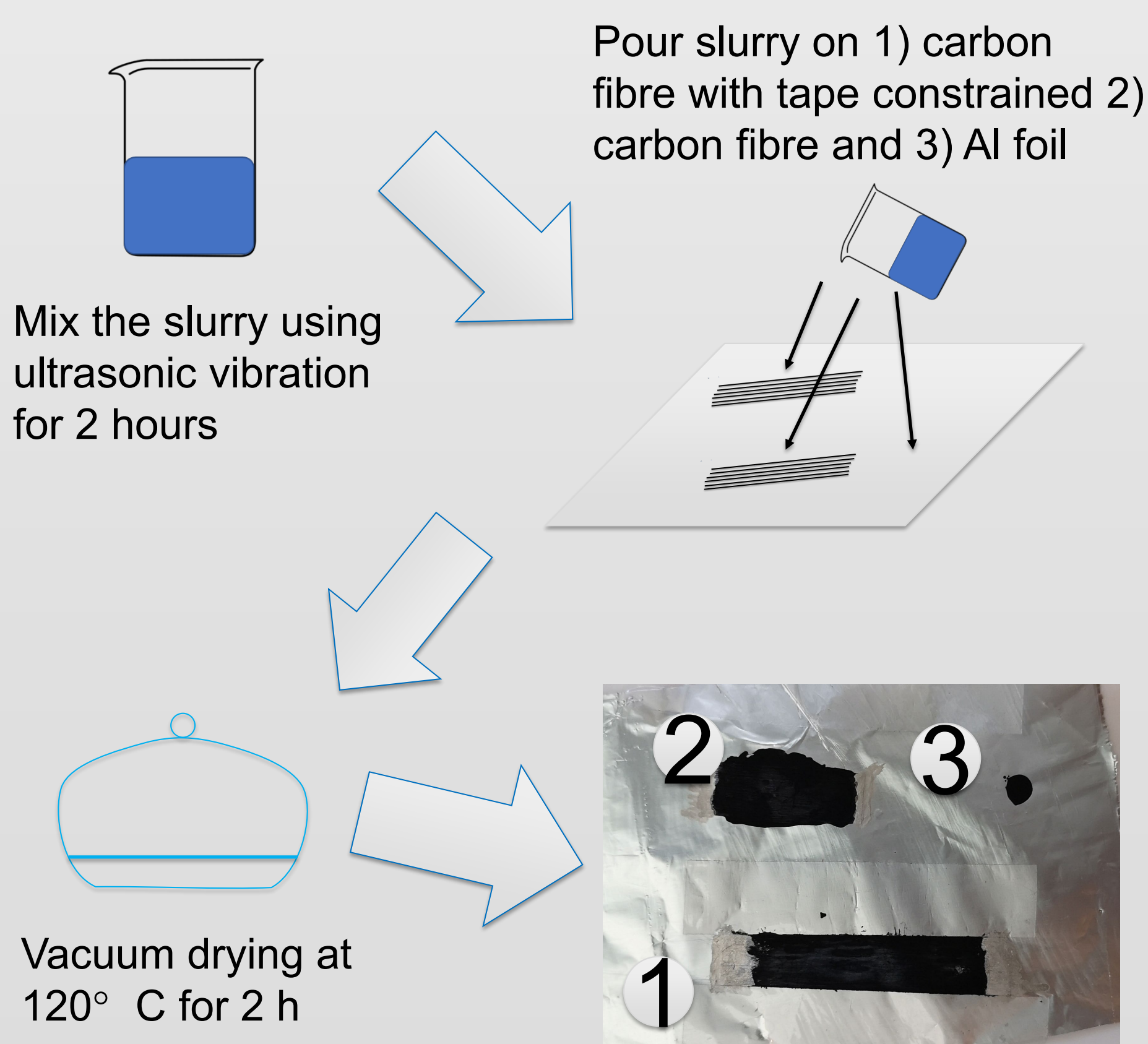


Figure 1. Experiment steps

Preliminary Results

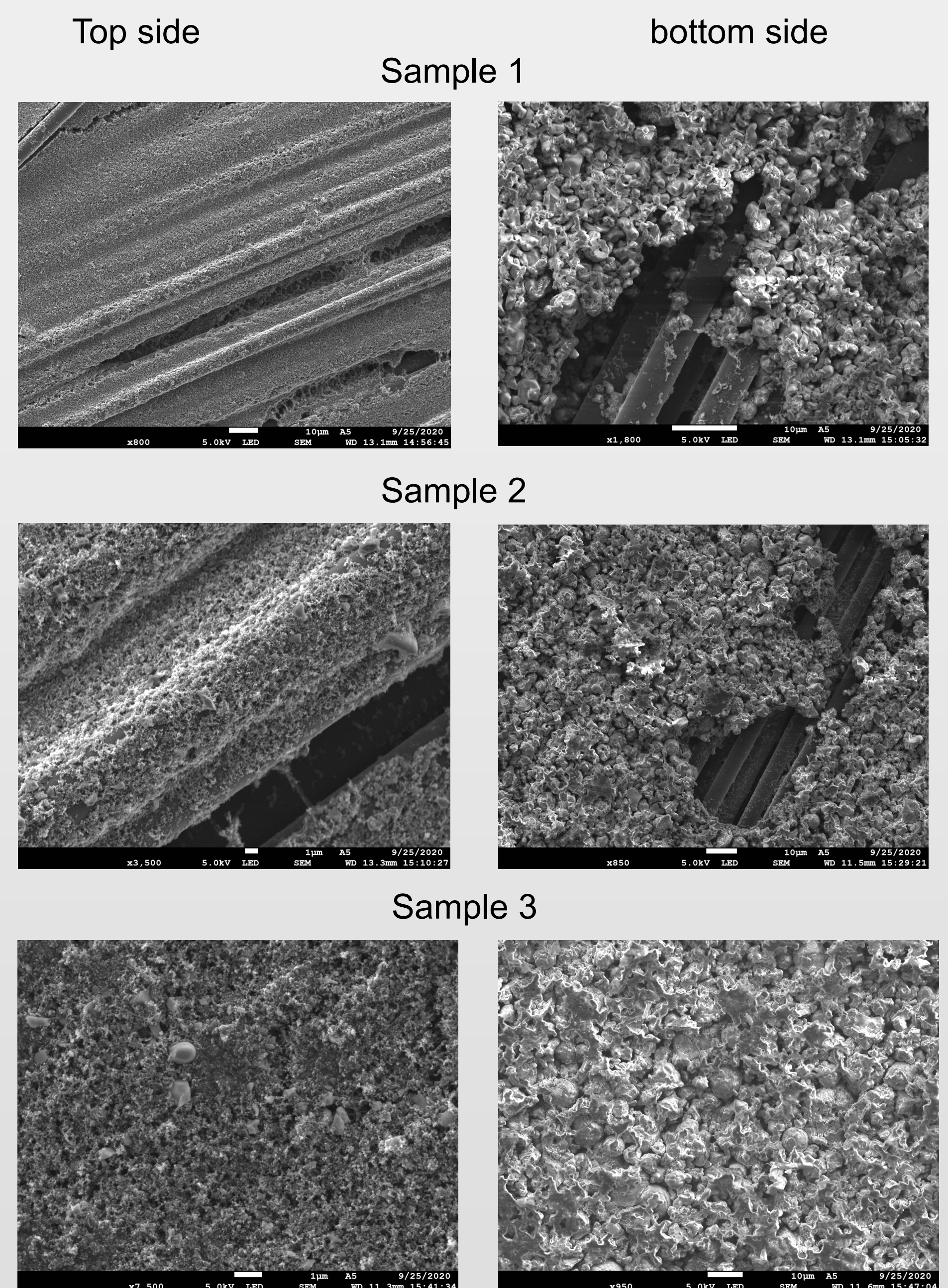


Figure 2. SEM photos of tape casted cathode

As showed in Fig. 2, small and lighter carbon black is accumulated at top surface, whereas big LiFePO_4 particles are accumulated at bottom.

Conclusion

- The current slurry does not form homogenous distribution of LiFePO_4 , carbon black particles.
- Carbon fibre doesn't influence the distribution of solid particles very much, which means the solid content in slurry can be increased to 50% as common value used in cathode casting