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Optimized electrode/electrolyte interface of MWCNT-SnO₂ composite through gas-solid fluorination

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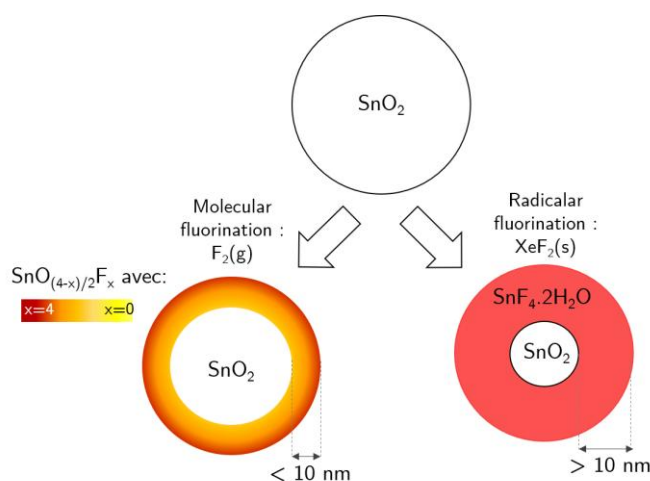
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The benefit of enriching Solid-Electrolyte Interface with fluorine atoms through the use of fluorinated additives into the electrolyte composition has recently gained popularity for anode materials used in secondary lithium-ion battery [1]. Another strategy is to provide these fluorine atoms via surface fluorination of the electrode material, particularly for MWCNT-SnO₂ based composites where fluorination must act selectively on SnO₂. Our study presents two methods of surface fluorination applied on MWCNT-SnO₂, one using F₂(g) and the other XeF₂(s). These fluorinating agents are known for their different particle penetration depths. An ultra-thin and very dense fluorinated layer achieved by the action of F₂(g) allows to form a very stable interface leading to gravimetric capacities of 789 mAh.g⁻¹ after 50 cycles. A thin and porous fluorinated layer made by XeF₂(s) action favors the formation of a new Sn-based fluorinated phase never reported in the literature which also stabilizes capacities over 50 cycles. In any case, the value of adding fluorine atoms to the surface of the electrode material to improve cycle stability is demonstrated [2].



Scheme 1. Selective fluorination of Tin oxide in front of carbon nanotube through the use of molecular fluorine

References

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[2] Gervillié, C., Dubois, M., El-Ghozzi, M., Berthon-Fabry, S., Boisard, A., Labbé, J., Guérin, K., ACS Applied Materials and Interfaces 2021, 13(24), 28150–28163.