Popular Science Summary

Have you ever considered buying an electric car? What do you think is most appealing to you or what is holding you back from buying one? One thing that most people will be concerned about for sure: battery range. In an electric car, the battery is one of the most important components as it is the power source for the entire vehicle, while the key to determining battery performance is the electrode material inside, which affects the range capacity and charging speed. The commercially available electrode materials on the market include LFP, known for its stability, and NMC811, recognized for its high capacity. Electric vehicle fires are also a major safety concern that plagues many people who want to purchase electric vehicles. Batteries using LFP materials have higher thermal stability, while batteries using NMC materials have lower ignition temperatures and are more prone to fire. Therefore, whether it is possible to directly mix the two to obtain an electrode that not only has a high capacity but also demonstrates high stability is a question in this study.

The pollution and recycling of lithium-ion batteries is another important topic, as many of the world's leading battery companies have announced that they will begin to increase their investment in the production of cleaner and greener batteries. In the conventional lithium-ion battery electrode preparation process, wet coating technology is widely used. Coating means depositing the electrode active material, such as LFP, on a conductive aluminum or copper foil. However, the wet coating process requires the use of the toxic NMP solvent, which poses significant environmental and health risks and creates a lot of trouble for subsequent solvent recovery and treatment. In recent years, dry coating process technology has gradually become the focus of research because it doesn't involve the usage of any toxic solvents. However, solid particles and liquids have different properties. Liquids can be easily spread on aluminum foil, while it is difficult to achieve uniform powder deposition for solid particles The current

mainstream technologies, such as electrostatic spraying, require very sophisticated instruments and an extremely dust-free working environment, which is not conducive to the promotion of this technology. Thus, another focus of this article is to develop a novel coating technique for rapid and efficient dry coating deposition. The experimental results prove that the developed serrated blade can efficiently realize the deposition of solid particles and a thin film with good uniformity. The performance of batteries prepared by the two processes was tested, and the results showed that the dry coating process exhibited performance equal to or even better than the wet coating process. This demonstrates the great potential of the dry coating process. Meanwhile, the results also show that the combination (blending) of LFP and NMC materials is not a good strategy.