UNIVERSITÄT DUISBURG ESSEN

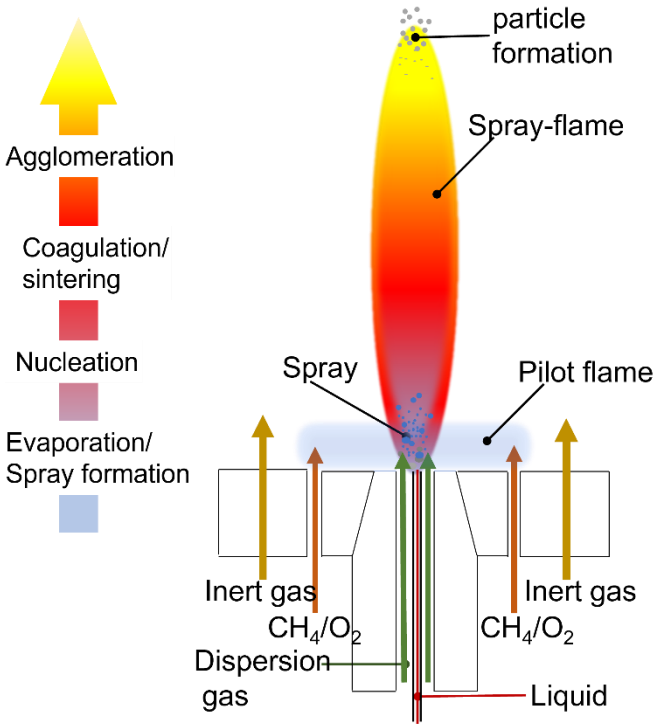
IVG Institut für Verbrennung und Gasdynamik
Fakultät für Ingenieurwissenschaften

Master thesis

Spray flame synthesis of anode material for sodium ion battery

Background:

The current shortage of fuels has forced scientists to look for renewable energy sources. And storing the energy generated is also a crucial step toward the goal of reducing overall carbon emissions. Although we have already launched Li-ion batteries, the future of Li-ion batteries is difficult due to the limited occurrence of Li in the Earth's crust. Therefore, research is focused on more readily available cation-ion batteries (e.g. sodium).



The sodium-ion battery works almost the same way as the Li-ion battery. Therefore, a high performance anode is a great advantage for understanding the sodiation mechanism. The $NaTiO_2$ (NTO) anode[1] has attracted much attention recently. However, much of the battery process is still unclear. And there are almost no published data on the synthesis of NTO from the spray flame reactor. The first challenge is the synthesis of layered NTO nanoparticles from the spray flame reactor and the subsequent application of these nanoparticles in the electrochemical performance tests.

Task description:

a) Investigation of the proper conditions for the synthesis of the NTO layered phase. Iterative adjustment of the hot wall reactor to improve the process control.

b) Characterization of the structure, surface, morphology and chemical composition of the materials produced.

c) Analysis of the electrochemical performance of selected nanoparticles as anode materials in sodium ion batteries.

Requirements:

Degree in engineering, physics, or chemistry; interest in/basic knowledge of battery technologies/electrochemistry, nanoparticles, and systems engineering is helpful but not a requirement. Enjoyment of interdisciplinary, experimental work, initiative, and ability to work in a team are expected. Knowledge of the English language (speaking and reading) is an advantage.

Start: anytime **Duration:** by arrangement

1. Wu, D., et al., *NaTiO2: a layered anode material for sodium-ion batteries.* Energy & Environmental Science, 2015. **8**(1): p. 195-202.

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