

PRAPHAIPHON PHONSUKSAWANG : IRON-ADDED NICKEL COBALT
SULFIDE ON NICKEL FOAM AS ELECTRODE FOR HIGH-PERFORMANCE
SUPERCAPACITOR. THESIS ADVISOR : ASST. PROF. THEERANUN
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SUPERCAPACITOR/NICKEL COBALT SULFIDE/BINDER-FREE

Supercapacitors are energy storage devices which are capable of fast charge-discharge. The most important component of supercapacitor is the electrode. Nickel cobalt sulfides with high electrochemical activity, high capacitance and high electrical conductivity are widely studied as electrodes for supercapacitors. The current work studies the binder-free NiCo_2S_4 electrode prepared by a simple one-step hydrothermal method with the addition of FeCl_3 . Effects of the amount of Fe^{3+} ion on structure, morphology and electrochemical performance are investigated. While adding FeCl_3 has no effect on the crystal structure, the sample morphologies change from net-like to agglomerated 3-D particles. The specific capacitance of the prepared NiCo_2S_4 electrode is 98 mAh/g at 10 A/g. The value significantly increases with added FeCl_3 content and adding 1.61 mol% of FeCl_3 increase the specific capacitance to 167 mAh/g at 10 A/g, which is a 170% improvement. Both experimental and computational results revealed that the enhanced performance is caused by the improved electrical conductivity and improved electrolyte adsorption. The prepared electrodes show moderate cycle stability as the capacitance is maintain at least 58% of the original value after 1,000 cycles.

School of Chemistry

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Student's Signature 

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