**Abstract**

A facile sol-gel [thermolysis](https://www.sciencedirect.com/topics/chemistry/thermolysis" \o "Learn more about Thermolysis from ScienceDirect's AI-generated Topic Pages) route was adopted to synthesize KNiPO4 [nano-sheets](https://www.sciencedirect.com/topics/chemistry/nanosheet" \o "Learn more about Nanosheet from ScienceDirect's AI-generated Topic Pages) for the design of hybrid [supercapacitors](https://www.sciencedirect.com/topics/chemistry/supercapacitors" \o "Learn more about Supercapacitors from ScienceDirect's AI-generated Topic Pages). The phase purity, [homogeneity](https://www.sciencedirect.com/topics/chemistry/homogeneity), and functional groups present in the synthesized KNiPO4 were characterized through X-ray diffraction and FTIR measurements. [Field emission scanning electron microscopy](https://www.sciencedirect.com/topics/chemistry/field-emission-scanning-electron-microscopy) (FESEM) and [transmission electron microscopy](https://www.sciencedirect.com/topics/chemistry/transmission-electron-microscopy) (TEM) images showed that the nano-sheet-like particles were loosely stacked. The electrochemical properties of the KNiPO4 [electrode](https://www.sciencedirect.com/topics/chemistry/behavior-as-electrode) were studied in various aqueous-based electrolytes such as 1 M LiOH, 1 M NaOH, and 1 M KOH to explore their superior performances. Among these electrolytes, the KNiPO4 electrode provided a maximum specific capacity of 278 C g−1 in 1 M KOH at 5 mV s−1. A hybrid supercapacitor was fabricated using the synthesized KNiPO4 as the positive electrode and [activated carbon](https://www.sciencedirect.com/topics/chemistry/activated-carbon) as the negative electrode in a 1 M KOH [aqueous electrolyte](https://www.sciencedirect.com/topics/chemistry/electrolyte-solution). The supercapacitor exhibited a specific capacitance of 48 F g−1 in 1 M KOH at 0.6 mA cm−2 and energy density of 13 Wh kg−1 at a power density of 59 W kg−1. In addition, the hybrid system retained 93% of its initial specific capacitance even after 2000 cycles. A KNiPO4-based hybrid system thus exhibits superior characteristics and hence is a promising candidate for high-performance electrochemical energy storage devices.