

Abstract

High surface area nanostructured electrodes are essential for understanding charge storage mechanisms in high capacitance supercapacitors. Additionally, a growing number of studies provide credible evidence that the highest capacitance in carbon nanomaterials is attainable only when the pore size is in micropore range. In this study therefore, micropore-dominated carbon materials derived from *Parinari curatellifolia* (PC) waste seeds are prepared via pyrolysis and subsequent chemical activation with KOH. SEM, EDAX, TEM, Raman, and XRD studies show that the microstructure and composition of the as-prepared microporous carbon materials are influenced by adjusting the KOH to carbon mass ratio. Sorption studies demonstrate a very high BET surface area of $1898 \text{ m}^2 \text{ g}^{-1}$, type I isotherm, and 99% micropore content in all the samples. The BET surface area, S, V, and total volume increased with increasing KOH content during activation. The fabricated electrodes exhibit high specific capacitances of 423 F g^{-1} at 5 mV s^{-1} and cyclic stability of 98% after 50000 cycles both of which are indicative of our carbon materials huge potential in making high performance supercapacitors. The specific capacitance increased with the micropore content in the samples signifying that the pores enhanced diffusion and hence the charge storage. The PC carbon materials deliver high specific capacitance due to the enhancement of diffusion and charge storage stemming from the synergetic interplay of the aforementioned textural parameters. The PC carbon materials therefore provide good prospects for supercapacitor applications.