Biowaste sago bark based catalyst free carbon nanospheres: Waste to wealth approach

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ABSTRACT: Catalyst free carbon nanospheres were synthesized using simple one step pyrolysis techniques where biowaste sago bark is used as a carbon precursor. Obtained carbon nanospheres showed porous nature and revealed that more than 95% carbon is present in the synthesized carbon nanospheres with particle size ranging from 40-70 nm. Electrochemical study showed specific capacitance value of 180 Fg^{-1} at 2 mVs^{-1} and the cycling stability up to 1700 cycles. Obtained carbon nanospheres are useful in super capacitor applications. Presented study revealed waste to wealth approach thereby reducing waste in the environment.

INTRODUCTION

Carbon based nanomaterials have promising applications in nanoelectronics [1], microelectrical devices [2], electrochemistry [3,4], sensors [5], catalysis [6] and ultracapacitors [7–9]. Among different forms of carbon nanomaterials [10-13], carbon nanospheres are gaining interest because, in its spherical arrangement they are normally unclosed shells with rather waving flakes that follow the curvature of the sphere. This forms many open edges at the surface creating reactive ‘‘dangling bonds’’ which provides the spheres with high chemical activity; establishing them as good candidates for their use in various applications [11].

Various methods have been reported for the synthesis of carbon nanospheres transition and/or rare earth metal oxides as catalysts [14], carbon nanospheres from the carbonization of polyethylene–poly-(vinyl chloride) in a sealed gold tube under a pressure of 30 MPa [15], in carbon vapor from the decomposition of β-SiC powder [16] etc. Carbon nanospheres of 20–500 μm are found as a side product in the synthesis of fullerene by the deposition of gaseous carbon [17]. Arc discharge and laser ablation methods have also been used for the synthesis of structured carbon [18, 19]. Although the catalytically assisted chemical vapour deposition method is emerged as a promising technique [20], an economically viable method for the