Intense pulsed light (IPL)-assisted synthesis of metal oxide nanoparticles for supercapacitor applications

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Transition metal oxides have received tremendous interests in supercapacitors over the last decade due to their fast and reversible Faradaic redox reactions which is known as pseudo-capacitance. Several methods have been used to synthesize metal oxide nanostructures including chemical bath deposition, hydroxide decomposition, thermal decomposition of carbonates, nanocasting, electrodeposition, combustion, coprecipitation and the sol–gel method. Many of these have drawbacks in that they are energy consuming, lengthy and involve multiple steps. Especially, all methods require calcinations/heat treatment at 200-600 ^{o}C for 1-24 hrs. Therefore, faster, more facile and energy-efficient methods for metal oxide nanostructure production are of interest. Here we report an agile and facile method for the preparation of high-performance supercapacitive metal oxide nanoparticles by using an intense pulsed light (IPL) technology. By this method, the metal oxide formation can be accomplished within milliseconds by irradiating the broad wavelength light with high energy density on metal oxide precursor, which is exceptionally faster than other metal oxide formation methods. We have fabricated various metal oxides nanoparticles on Ni-foam substrate by using the IPL technique. The as-prepared substrates are further utilized as a supercapacitor electrode, and their supercapacitive performance will be discussed in the presentation.

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