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Enhancement of specific capacitance and catalytic activities of MnO2 nanoparticles assisted with PVA and PVP

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Abstract: In this present study, MnO_2 nanoparticles were synthesized by hydrothermal method and along with MnO_2 nanoparticles doped with poly Vinyl Alcohol (PVA) and poly Vinyl Pyrrollidone (PVP) nanoparticles. The synthesized nanoparticle's specific capacitance properties were analyzed by AC impedance and cyclic-voltametric techniques. Catalytic activities of MnO_2, with PVA and PVP assisted nanoparticles on dye removal capacity were done on rhodamine-B dye. The size of these nanoparticles from SEM study observed that all of these nanoparticles were in the nanoscale range. The results of these study reveals that with respect to specific capacitance value of MnO_2 assisted PVA nanoparticles have shown very high value (1235 F/g) when compared with Pure MnO_2 (164F/g) and MnO_2 assisted with PVP (151 F/g) nanoparticles. The SEM study of PVA assisted MnO_2 nanoparticles has dense spindle shape with high surface to volume ratio compared with other nanoparticles was the main reason for having high specific capacitance value. The size of the synthesized nanoparticles was calculated by powder XRD study and it is observed that among the three nanoparticles, the pure MnO_2synthesized particles has very low size reduction (10.12 nm) compared with other nanoparticles. The effective catalytic activity of MnO_2 nanoparticles on dye removal (rhodamine-B) depends on small size of the nanoparticles.
Key words: MnO_2, surfactant PVA/PVP, Rhodamine-B.

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