**Nanoparticles Synthesis**

1. **Pd CMC synthesis:** 40mg Na2PdCl4 dissolved in 20ml nitrogen-bubbled distilled H2O was transferred into a 50ml three neck flask under Nitrogen. 382mg Sodium carboxyl methyl cellulose (poly anionic stabilizer) was dissolved in H2O and added to the above solution, then allow to stir for 1 hour. 110mg NaBH4 was dissolved in 3ml of H2O and added to the mixture of sodium salt and CMC. The mixture was stirred overnight. pH= 9.5



*Ind. Eng. Chem. Res., 2015, 54,3, 790-797*

1. **Pd/Fe/Co CMC synthesis:** 15mg Na2PdCl4 dissolved in 20ml distilled H2O inside a 50ml three neck flask under Nitrogen. 4mg FeSO4.7H2O was dissolved in 10ml of H2O and 1ml FeSO4.7H2O solution was added to sodium salt solution. 12mg CoCl2.6H2O dissolved in 10ml H2O was added to the above mixture. 382mg Sodium carboxyl methyl cellulose dissolved in 20ml H2O was also added and stirred for 1 hour. 25mg NaBH4 dissolved in 2.5ml H2O and stirred overnight. pH= 9.0



*Ind. Eng. Chem. Res., 2007, 46(1) pp 29-34*

1. **Pd PVP synthesis:** 0.3g PdCl2 dissolved in 20ml H2O and 1g Polyvinylpyrrolidone (nonionic) at 30oC. 7mg NaBH4 dissolved in 10ml H2O was added to the mixture.



*Journal of Nanoscience and Nanotechnology vol. 17, 2833 – 2835, 2017*

1. **Pd CTAB synthesis:** 0.3g PdCl2 dissolved in 0.8g Cetyl trimethyl ammonium bromide (cationic) at 30oC. 7mg NaBH4 dissolved in 10ml H2O was added to the mixture.



*Journal of Nanoscience and Nanotechnology vol. 17, 2833 – 2835, 2017*

1. **Pd SDS synthesis:** 0.3g PdCl2 dissolved in 6.5g Sodium dodecyl sulfate (anionic) at 30oC. 7mg NaBH4 dissolved in 10ml H2O was added to the mixture.



*Journal of Nanoscience and Nanotechnology vol. 17, 2833 – 2835, 2017*

1. **Pd CMC synthesis:** 10mM PdCl2 solution was added to 1.0 wt % Sodium carboxyl methyl cellulose solution with 0.1M NaOH at 80oC



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