NEW Pd-POLYANILINE COMPOSITES FOR CATALYTIC HYDROGENATION OF QUINOLINE

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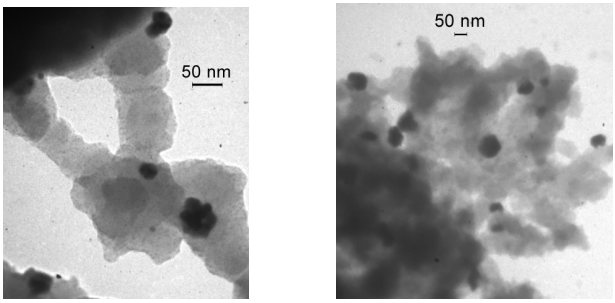
Development of new efficient catalysts for hydrogenation of organic compounds is important task of modern physical chemistry. Change of carrier for metallic nanoparticles can make significant influence on the catalytic activity of the system [1] and can be one of the ways for reduction of the platinum-group-metals content. Moreover, the size, shape and catalytic activity of metallic nanoparticles can depend on the nature of the carrier used for preparation of the composite. The aim of this study was to reveal the specific features of the composites, prepared by deposition of Pd nanoparticles on polyaniline (PANI), and to evaluate the influence of such composites structure on their catalytic efficiency in hydrogenation of quinoline.

The composites were prepared by deposition of Pd nanoparticles on the polyaniline as a result of treatment with $PdCl_2$ solution. It was shown by transmission electronic microscopy (TEM), that the composites contained Pd nanoparticles of size 20–30 nm, assembled in 50–80 nm aggregates (Fig. 1). Increase of $PdCl_2$ concentration in the solution led to formation of larger aggregates of Pd (sample 2, Fig. 1(b), compared to sample 1, Fig. 1(a)) at the same overall Pd content.



(a) (b)

Figure 1. TEM images of samples Pd/PANI, prepared by deposition of Pd from $PdCl_2$ on PANI. Sample 2 (fig. b) was prepared at 5-fold higher concentration of $PdCl_2$, than used for sample 1 (fig. a)

It was found, that 1,2,3,4-tetrahydroquinoline (THQ) was the sole reaction product at hydrogenation of quinoline at presence of the composites. Among the studied samples, the highest yield of THQ was found in the case of sample 1 (yield 77 % at $p(H_2)$ = 100 atm, T = 100 °C, reaction time 24 h in methanol), while in the case of sample 2 the yield of THQ was 53 % in the same conditions. Difference in the yields of THQ is consistent with the difference in Pd nanoparticles size in the composites.

[1] Gong Y., Zhang P., Xu X., Li Y., Li H., Wang Y., J. Catal., 2013, 297, 272–280.