

CATALYTIC REDUCTIVE AMINATION AND HYDROGENATION
OF BENZALDEHYDEAsaula V. M.¹, Kushchenko I. V.¹, Gavrilenko K. S.^{2,3}, Pariiska O. O.¹, Ryabukhin S. V.²,
Volochnyuk D. M.^{3,4}, Kolotilov S. V.¹¹L. V. Pisarzhevskii Institute of Physical Chemistry of the National Academy of Sciences
of Ukraine, Kyiv, Ukraine²Enamine Ltd, Kiev, Ukraine³ChemBioCenter, National Taras Shevchenko University of Kyiv, Ukraine⁴Institute of Organic Chemistry of the NAS of Ukraine, Kiev, Ukraine

i_kushchenko@ukr.net

Reactions of catalytic amination of carbonyl compounds are widely used for production of amines. In particular, interaction of benzaldehyde with aliphatic amines at presence of H₂ can lead to N-benzyl-N-alkylamines. Such reactions are usually catalyzed by compounds, containing platinum group metals (PGM). Search of PGM-free catalysts for such transformations is important task of modern physical chemistry. The aim of this study was to check catalytic activity of the composites, containing Co oxides and N-doped carboneous materials, in catalytic reductive amination of benzaldehyde with *i*-propylamine.

The nanocomposites were prepared by pyrolysis Co(II) complexes with phenantroline or *o*-phenylenediamine on aerosil (highly disperse SiO₂). It was shown by transmission electronic microscopy that the nanocomposites contained carboneous species with size of separate particles *ca.* 10–50 nm. Analysis of the Raman spectral data (Fig. 1) allowed to conclude that the graphene-like particles had more than 8 carbon monolayers. The size of carboneous particles, separated from the carrier, was in range from 80 to 120 nm according to the results of dynamic lights scattering in suspension.

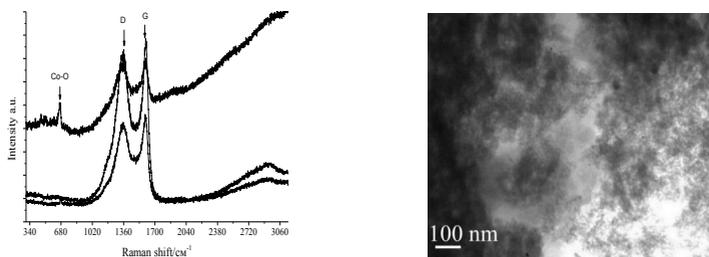


Fig. 1. Raman spectra of the composites (left) and TEM image of the Co/C/SiO₂ nanocomposite (right)

The catalytic activity of the obtained nanocomposites in reaction of benzaldehyde with *i*-propylamine under H₂ pressure (50 atm, 150 °C) was studied. The yield of N-benzyl-N-*i*-propylamine was *ca.* 5 %, while benzylic alcohol was the major product. Addition of ZnCl₂ as Lewis acid led to higher yield of N-benzyl-N-*i*-propylamine. However, treatment of benzylic alcohol and *i*-propylamine in the same conditions under H₂ pressure did not lead to formation of N-benzyl-N-*i*-propylamine, indicating that the reaction did not involve benzylation of *i*-propylamine by benzylic alcohol as possible intermediate stage.