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Author: Anna Śrębowata Karolina Tarach Vladimir Girman
Kinga Góra-Marek



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Catalytic removal of trichloroethylene from water over palladium loaded microporous and hierarchical zeolites

Anna Śrębowata^a, Karolina Tarach^b, Vladimir Girman^c and Kinga Góra-Marek^{b*}

^aInstitute of Physical Chemistry PAS, Kasprzaka 44/52, 01-224 Warsaw, Poland

^bFaculty of Chemistry, Jagiellonian University in Kraków, 3 Ingarden Street, 30-060 Kraków, Poland

^cPavol Jozef Šafárik University in Košice, Department of Condensed Matter Physics, Park Angelinum 9, 041 54 Košice, Slovakia

corresponding author:

Kinga Góra-Marek, Faculty of Chemistry, Jagiellonian University in Kraków, 3 Ingarden Street, 30-060 Kraków, Poland, phone: +48 12 663 20 81, e-mail: kinga.goramarek@gmail.com

Graphical abstract

Highlights

- Catalytic performance of Pd-zeolites in TCE HDC depends on their acidic and textural properties.
- Both factors influence both noble metal dispersion and Pd⁰/Pd²⁺ ratio.
- The best results of TCE HDC for palladium deposited on desilicated form of ZSM-5.

ABSTRACT

The work was aimed to investigate the catalytic properties of Pd-containing ZSM-5 zeolites in hydrodechlorination of trichloroethylene (TCE HDC) in aqueous phase. Conventional purely microporous zeolite ZSM-5 and its mesostructured analogue obtained by alkaline leaching were used as the supports for palladium moieties. The resulting materials were subjected to chemical analysis, XRD characterization, CO chemisorption, and spectroscopic investigation (XPS and FTIR) and, then, used as the catalysts in removal of trichloroethylene from drinking water. The studies have shown clearly that catalytic performance of palladium loaded materials depended on acidic and textural properties of zeolites, which influenced both noble metal dispersion and Pd⁰/Pd²⁺ ratio. In a series of the zeolite catalysts the best results were obtained for palladium deposited on desilicated form of ZSM-5. Palladium in the form of uniformly dispersed species, containing large amount of Pd⁰ species was found to be significantly active in TCE HDC.

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