Use of transition metal oxides as catalysts in AOPs for water treatment

Mašín P.[1], Kroužek J.[2], Hendrych J.[2], Tišler Z.[3]

[1]*Dekonta, a.s, Dřetovice, Czech Republic*
[2]*University of Chemistry and Technology, Prague, Czech Republic*
[3]*ORLEN UniCRE, Litvínov, Czech Republic*

Advanced oxidation processes (AOPs) are modern powerful techniques which have received still more attention in many fields of water management including waste water or drinking water treatment. AOPs are characterized by radical mechanism of organic contaminant mineralization in water based on environmentally compatible reactive oxygen species involving processes such as Fenton's oxidation, photooxidation, ozonation, photocatalysis, electrooxidation etc. On one hand, AOPs can be very efficient even in the oxidation of persistent pollutants and often at low energy or material consumption, on the other hand, all these techniques suffer from many limitations in the range of the conditions for efficient contaminant removal regarding particularly water characteristics. Recently, the R&D activities are targeted especially to AOPs application in abatement of contaminants of emerging concern.

In our project, we started to further develop some of these technologies by the implementation of heterogeneous catalysis in water treatment. This contribution will introduce the part of large dataset from laboratory model experiments aimed on catalytic activities measurements in photocatalysis and catalytic wet air oxidation (CWAO) processes. The goal of these experiments was to search for catalyst selection of high efficiency in the decomposition of model pollutants in distilled water as a first step of applied research and technology development. We tested several tens of various materials prepared by various methods. As photocatalysts, many modified TiO_2 suspensions were evaluated in methylene blue oxidation. In CWAO, a lot of forms of modified activated zeolite foams and hydrotalcite-like catalysts were prepared and tested at various laboratory setups. According to results, we selected narrow group of perspective catalysts which will be further tested in detail at conditions closer to real water systems. In our project, now we are upscaling some of these catalytic processes in order to verify them in the treatment of real water samples next year.