2015.1.30 安盛

A. W. Morawski 教授　ご講演のご案内　Ⅱ

光触媒のご研究で国際的にご活躍をされています Antoni W. Morawski 教授（West Pomeranian University of Technology, Poland）を、学長外国人特別招へい研究者として本学にお招きし、講演をしていただくことになりました。ご興味のある皆様にはぜひご聴講にお越し頂きたく、ご案内いたします。

日時：　2015 年 2 月 19 日（木）16:00～17:00
場所：　東京理科大学･野田キャンパス･光触媒国際研究センター･会議室

Progress in application of TiO_2 photocatalyst for environmental problems - from laboratory to large scale installation

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Significant contamination of surface water and groundwater with various organic compounds coming from both industry and agriculture is commonly observed. Many of these contaminants are ineffectively removed in conventional water treatment processes. Therefore, efficient and cost-effective methods should be applied. Advanced Oxidation Processes (AOPs) seem to be one of the most promising solutions for this problem. Amongst various AOPs photocatalysis is of a special interest. However, one of the major problems associated with this process is separation of a photocatalyst from the purified medium after the treatment. Therefore, different procedures of photocatalyst immobilization as well as separation by membrane processes are widely investigated. The TiO_2 photocatalyst produced in a large scale laboratory installation developed in the Institute was compared with the commercial P 25.

A pilot scale photocatalytic plant with a capacity of 1.5 m^3 was applied for photodegradation of organic contaminants (trichloroethene (TCE), tertrachloroethene (PCE), phenol, etc.) in water. TiO_2 photocatalyst deposited on various supports was applied during photocatalytic runs. Two different procedures of TiO_2 immobilization were applied. In the first case the TiO_2 was supported on a steel mesh using a photocatalytic paint and in the second one a fiberglass cloth served as a support. Additionally, a commercially available Photospheres-40 (Microspheres Technology) were used. Application of TiO_2 immobilized on a fiberglass cloth allowed to reduce costs of energy required for decomposition.

The photocatalytic membrane reactors (PMRs) utilizing direct contact membrane distillation (DCMD) or pressure driven membrane techniques, such as microfiltration (MF) and ultrafiltration (UF) were applied for treatment of water and wastewater. The MF/UF membranes are efficient in separation of photocatalyst particles; however, low molecular weight compounds can pass easily through them. Therefore, it is very important to carefully select the residence time of the contaminants in the reactor. Another problems occurring in case of PMRs equipped with MF/UF membranes are membrane stability and fouling due to TiO_2 particles. On the opposite, no membrane fouling due to TiO_2 deposition was found in the PMR utilizing DCMD. Moreover, the quality of the product (treated water) was much higher than in the systems coupling photocatalysis and MF/UF. However, taking into account the maturity of the technology, the PMRs utilizing the pressure driven membrane techniques have more potential for full scale application.

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