- Wawrzkiewicz M. Application of various sorbents in the process of removing dyes from aqueous solutions and industrial wastewater. Przemysł Chemiczny 2012; 91(1): 45-52.
- Hassani A H, Mirzayee R, Nasseri S, Borghei M, Gholami M, Torabifar B. Nanofiltration process on dye removal from simulated textile wastewater. *Interna*tional Journal of Environmental Science and Technology 2008; 5(3): 401-408.
- Abid M F, Zablouk M A, Abid-Alameer A M. Experimental study of dye removal from industrial wastewater by membrane technologies of reverse osmosis and nanofiltration, *Iranian Journal of Environmental Health Science & Engineering* 2012; 9(1): 17-26.
- Argun M E, Karatas M. Application of Fenton process for decolorization of Reactive Black 5 from synthetic wastewater: kinetics and thermodynamics. Environmental Progress & Sustainable Energy 2011; 30(4): 540-548.
- Polat D, Tulay I B, Ozbelge A. Catalytic ozonation of an industrial textile wastewater in a heterogeneous continuous reactor. *Journal of Environmental Chemi*cal Engineering 2015; 3(3): 1860-1871.
- Dinarvand M. Decolorized of textile dye waste waters by hydrogen peroxide, UV and sunlight. *International Journal of ChemTech Research* 2014; 6(2): 985-990.
- Shu H Y, Hsieh W P. Treatment of dye manufacturing plant effluent using an annular UV/H<sub>2</sub>O<sub>2</sub> reactor with multi-UV lamps. Separation and Purification Technology 2006; 51(3): 379-386.
- Shu H Y, Chang M C, Hsieh W P. Decolorization and mineralization of a phthalocyanine dye C.I. Direct Blue 199 using UV/H<sub>2</sub>O<sub>2</sub> process. *Journal of Hazardous Materials* 2005; 125(1-3): 96-101.
- Nanwen Z, Lin G, Haiping Y, Ziyang L, Liang W, Xin Z. Degradation pathway of the naphthalene azo dye intermediate 1-diazo-2- naphthol-4-sulfonic acid using Fenton's reagent, Water Research 2012; 46: 3859-3867.
- Barbusiński K, Majewski J. Discoloration of azo dye Acid Red 18 by Fenton reagent in the presence of iron powder. Polish Journal of Environmental Studies 2003; 12(2): 151-155.
- Ehrampoush M H, Moussavi G H R, Ghaneian M T, Rahimi S, Ahmadian M. Removal of methylene blue dye from textile simulated sample using tubular reactor and TiO<sub>2</sub>/UV-C photocatalytic process. *Iranian Journal of Environmen*tal Health Science & Engineering, 2011; 8(1): 35-40.
- Rahmani A R, Zarrabi M, Samarghandi M R, Afkhami A, Ghaffari1 H R. Degradation of Azo Dye Reactive Black 5 and Acid Orange 7 by Fenton-Like Mechanism. *Iranian Journal of Chemical Engi*neering 2010; 7(1): 87-94.
- Barbusiński K. Modification of Fenton reaction using calcium and magnesium peroxides (in Polish). Monograph, Central Mining Institute, Katowice 2006.

- Pieczykolan B, Płonka I, Barbusiński K. Discoloration of dye wastewater by modified UV-Fenton process with sodium percarbonate. Architecture Civil Engineering Environment, ACEE 2016; 4: 135-140.
- Solecka M, Ledakowicz S. Biological treatment of coloured textile wastewater, (in Polish) *Biotechnologia* 2005; 2 (69): 103-124.
- Willmott N, Guthrie J, Nelson G. The biotechnology approach to colour removal from textile effluent. *Journal Society of Dyers and Colourists* 1998; 114: 38-41.
- Ledakowicz S, Solecka M, Zylla R. Biodegradation, decolourisation and detoxification of textile wastewater enhanced by advanced oxidation processes. *Jour*nal of Biotechnology, 2001; 89: 175-184.
- Pfaltz & Bauer, Safety Data Sheet, Prepared: 3/10/2017, www.pfaltzandbauer. com
- 27. PN-EN ISO 10523:2012 Water Quality. Determination of pH.
- PN-ISO 15705:2005 Water quality.
  Determination of the chemical oxygen demand index (ST-COD). Small-scale sealed-tube method.
- Kang Y W, Cho M J, Hwang K Y. Correction of hydrogen peroxide interference on standard chemical oxygen demand test. Water Research 1999; 33: 1247-1251.
- BN-89/6191-04 Chemical reagents. Hydrogen peroxide about 30% (m/m), solution
- 31. PN-EN ISO 11348-3:2008 Water quality. Determination of the inhibitory effect of water samples on the light emission of *Vibrio fischeri* (Luminescent bacteria test). Method using freeze-dried bacteria.
- Persoone G, Marsalek B, Blinova I, Törökne A, Zarina D, Manusadzianas L, Nalecz-Jawecki G, Tofan L, Stepanova N, Tothova L, Kolar B, A practical and user-friendly toxicity classification system with microbiotests for natural waters and wastewaters. *Environmental Toxi*cology 2003; 18: 395-402.
- 33. Plahuta M, Tišler T, Toman M J, Pintar A. Efficiency of advanced oxidation processes in lowering bisphenol A toxicity and oestrogenic activity in aqueous samples. Arh Hig Rada Toksikol 2014; 65(1): 77-87.
- Papić S, Peternel I, Krevzelj Z, Kušić H, Koprivanac N. Advanced oxidation of an azo dye and its synthesis intermediates in aqueous solution: effect of Fenton treatment on mineralization, biodegradability and toxicity. *Environmental Engi*neering and Management Journal 2014; 13(10): 2561-2571.
- Barbusiński K. Toxicity of industrial wastewater treated by Fenton's reagent. Polish Journal of Environmental Studies 2005; 14(1): 11-16.

## Received 18.07.2017 Reviewed 01.09.2017

## Institute of Textile Engineering and Polymer Materials



The Institute of Textile Engineering and Polymer Materials is part of the Faculty of Materials and Environmental Sciences at the University of Bielsko-Biala. The major task of the institute is to conduct research and development in the field of fibers, textiles and polymer composites with regard to manufacturing, modification, characterisation and processing.

The Institute of Textile Engineering and Polymer Materials has a variety of instrumentation necessary for research, development and testing in the textile and fibre field, with the expertise in the following scientific methods:

- FTIR (including mapping),
- Wide Angle X-Ray Scattering,
- Small Angle X-Ray Scattering,
- SEM (Scanning Electron Microscopy),
- Thermal Analysis (DSC, TGA)

Strong impact on research and development on geotextiles and geosynthetics make the Institute Institute of Textile Engineering and Polymer Materials unique among the other textile institutions in Poland.

## Contact:

Institute of Textile Engineering and Polymer Materials University of Bielsko-Biala Willowa 2, 43-309 Bielsko-Biala, POLAND +48 33 8279114,

e-mail: itimp@ath.bielsko.pl www.itimp.ath.bielsko.pl