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Photocatalytic degradation of organic dyes using TiO2 nanotube arrays and aero-ZnO-ZnS under UV and visible light illumination

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Abstract

We report on the results of comparative study of the photocatalytic performances of the wide band gap semiconductor catalysts titania (TiO2), zinc oxide (ZnO) and mixed phase of ZnO-ZnS (zinc sulfide). The mixed phase structures show better photodegradation properties under UV and visible light illumination compared to its analogous forms. Rutile phase TiO2 nanotubes showed the highest catalytic activity, resulting in 70% decay of dye concentration within 85 min with visible light irradiation, while the rutile-anatase mixture of TiO2 degrade 75% of the test contaminant within 10 min under UV illumination. Microparticles and assemblies of nanostructures used in the experiments can be recycled effectively and subsequently reused.

References

1. M. C. V. M. Starling, C. C. Amorim and M. M. D. Leão, J. Hazard. Mater. pp. 17-23, 2019.
2. S. Bhatia and N. Verma, Mater. Res. Bull., pp. 468-76, 2017.
3. D. A. Yaseen and M. Scholz, Int. J. Environ. Sci. Technol, 2019.
4. S. H. Lin and C. M. Lin, Water Res., pp. 1743-1748, 1993.
5. Y. Sun, H. Zheng, M. Tan, Y. Wang, X. Tang, L. Feng, et al., J. Appl. Polym. Sci, 2014.
6. D. Georgiou, P. Melidis, A. Aivasidis and K. Gimouhopoulos, Dye. Pigment., pp. 69-78, 2002.
7. E. Chatzisymeon, N. P. Xekoukoulotakis, A. Coz, N. Kalogerakis and D. Mantzavinos, J. Hazard. Mater., pp. 998-1007, 2006.
8. P. Manekar, G. Patkar, P. Aswale, M. Mahure and T. Nandy, Bioresour. Technol., pp. 44-51, 2014.

9. C. Hou, B. Hu and J. Zhu, Catalysts, 2018.
10. M. Fakhrul Ridhwan Samsudin, S. Sufian, R. Bashiri, N. Muti Mohamed, L. Tau Siang and R. Mahirah Ramli, Mater. Today Proc, pp. 21710-21717, 2018.
11. M. Khaksar, M. Amini, D. M. Boghaei, K. H. Chae and S. Gautam, Catal. Commun., pp. 1-5, 2015.
12.M. Abbas, B. Parvatheeswara Rao, V. Reddy and C. Kim, Ceram. Int., pp. 11177-11186, 2014.
13. M. Enachi, M. Guix, T. Braniste, V. Postolache, V. Ciobanu, V. Ursaki, et al., Surf. Eng. Appl. Electrochem., pp. 3-8, 2015.
14. Y. K. Mishra, S. Kaps, A. Schuchardt, I. Paulowicz, X. Jin, D. Gedamu, et al., Part. Part. Syst. Char act., pp. 775-783, 2013.
15. I. Plesco, T. Braniste, N. Wolff, L. Gorceac, V. Duppel, B. Cinic, et al., APL Mater, 2020.
16. M. Enachi, M. Stevens-Kalceff, A. Burlacu, I. Tiginyanu and V. Ursaki, ECS Trans., pp. 167-173, 2012.
17. M. C. Newton, S. Firth, T. Matsuura and P. A. Warburton, J. Phys. Conf. Ser., pp. 251-255, 2006.
18. J. Al-Sabahi, T. Bora, M. Claereboudt, M. Al-Abri and J. Dutta, Chem. Eng. J., pp. 56-64, 2018.
19. Y. Yang and W. Zhang, Mater. Lett., pp. 3836-3838, 2004.
20. M. Hafeez, S. Rehman, U. Manzoor, M. A. Khan and A. S. Bhatti, Phys. Chem. Chem. Phys, pp. 9726-9734, 2013.