DEGRADATION OF ENVIRONMENTALLY TOXIC REFRACTORY COMPOUNDS IN SUSPENDED-BED REACTOR BY PHOTOCATALYTIC OXIDATION AND COMBINATION OF BIOLOGICAL TREATMENT WITH PHOTOCATALYSIS

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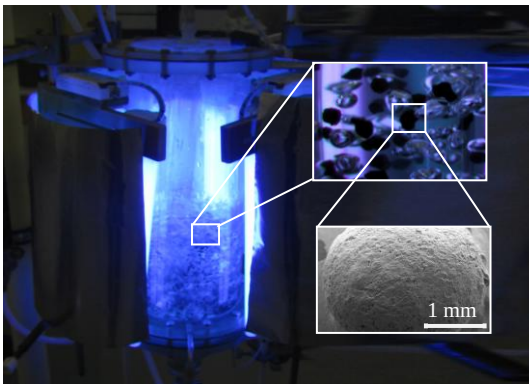
The experimental research into preparation of photocatalytically active titania coatings on lightweight expanded clay aggregates (LECA) to be used in suspended-bed reactor for photocatalytic oxidation of emerging water micropollutants was undertaken. The synthesis procedures were performed via sol-gel method using dip-coating technique. For coating preparation various sol-gel compositions and preparation conditions were examined. The coatings with superior performance in terms of photocatalytic activity and mechanical stability were applied for aqueous photocatalytic degradation of persistent pharmaceuticals, amoxicillin, doxycycline, prednisolone and sulfamethizole, and their mixture in larger lab-scale suspended-bed reactor. The toxicity reduction against selected bacterial strains during photocatalytic treatment as well as the potential for the coupling of photocatalytic pre-treatment with biological activated sludge process was studied.



The synthesis and immobilization of titania on LECA by means of sol-gel resulted in stable and photocatalytically active coatings with properties dependent on sol-gel processing parameters. Pharmaceuticals more prone to adsorption on titania coatings have higher photocatalytic oxidation reaction probability, i.e. higher degradation efficiency. The photocatalytic oxidation was accompanied by the significant decrease in the toxicity to several bacterial strains allowing the process application as a pre-treatment prior to biodegradation.

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