

MScEng Bursary available at the PRG-UKZN: Preparation and characterization of activated carbon for the removal of pharmaceutical contaminants from wastewater

Contaminants of emerging concern (CEC) are substances found in water and wastewater, which originate from personal care products, pharmaceuticals, pesticides, herbicides, etc. These compounds are toxic and have a low biodegradability, and accumulate in the environment. These molecules require advanced oxidation treatment for their treatment, which can be expensive and difficult to implement. A simpler alternative with lower cost could be the use of activated carbon for the adsorption of the CEC pollutants.

The Pollution Research Group (PRG), at the University of KwaZulu-Natal (UKZN), located in Durban, South Africa is leading research to explore and characterize the use of activated carbon for wastewater treatment, in collaboration with the University of Umeå (Sweden). The activated carbon will be generated from 3 types of biomass resources, namely eucalyptus, wattle and horse manure. The activated carbon performance to remove specific pharmaceutical compounds will be assessed in the laboratory. The process will be tested in a demonstration decentralized wastewater treatment plant system (DEWATS) that receives the effluent from 83 households in the community of Newlands-Mashu, South Africa. The goal of this project is to propose a solution for the refinement of the effluent from DEWATS using activated carbon.

The different biomass will be collected and carbonized through pyrolysis (for the eucalyptus, wattle and horse manure). The biochar produced from the biomass will then be processed for the production of activated carbon. Certain properties of the material will be characterized before and after activation, such as specific surface, porosity and surface charge. After that, adsorption batch tests will be conducted to characterize the thermodynamics and kinetics aspects of the process. The activated carbon production conditions will be varied to assess their influence on the adsorption performance of the material and to find the most optimal conditions. The MScEng student will participate in producing the activated carbon, characterizing the material surface and morphological properties, and evaluating its performance through batch tests. It is expected that three months of laboratory work will be necessary at Umeå University (Sweden) during the European summer of 2022.

A total bursary of R 150,000 will be paid to the MSc student over 15 months, with the possibility to receive a bonus of R20,000 according to the performance displayed during this period. Payment is made on set deliverables being achieved. The project will also cover the cost of a computer, tuition fees, all research operating expenses for conducting field work, the repatriation expenses (set until a certain limit) and the costs of a local conference.











It is required that the candidate for the position possesses a Chemistry or Chemical Engineering degree with a strong background in chemical thermodynamics and sorption phenomena. Laboratory skills, as well as ability to model and use of software such as Matlab or similar, will be an advantage. The position is to start from the January 2021.

UKZN is an equal opportunities employer. To apply for the position, please send a letter of motivation, an electronic copy of your transcripts, diplomas and CV to Dr. Santiago Septien Stringel <septiens@ukzn.ac.za> and Dr. David Lokhat <Lokhat@ukzn.ac.za> before the 18th of December 2020.

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