Pilot-plant processing of lignocellulosic biomass through pyrolysis and hydrothermal methods

PhD (Chemical Engineering) OR MEng (Chemical Engineering) (Research) (read more here about the programme and admission requirements)

Host: Prof. JF Görgens

Commencement: The successful candidate must assume postgraduate work between July 2025 and January 2026.

Bursary: The successful candidate will be offered a minimum bursary of ZAR170 000 per year of study, for two years (research-based Masters) or three years (PhD).

An opportunity for a full-time postgraduate research position at Masters or Doctoral (PhD) level, focused on pilot-plant processing of lignocellulosic biomass through pyrolysis and hydrothermal methods, is presently available in the research programs of the Department of Chemical Engineering. These positions will include pilot-scale optimisation of biomass processing with both pyrolysis and steam-explosion methods, with each method applied to achieve a different outcome, based on the chemical properties of liquid and solid products obtained. While the liquid products from these two processes will be considered for final application as is, the solid products will be further processed, including methods such as anaerobic digestion for biogas production. Both pyrolysis and steam explosion pilot-plant equipment have the capacity to process tens of kilograms of biomass materials per day of operation.

The aforementioned postgraduate projects will be conducted with the Bioresource Engineering group at the Department of Chemical Engineering, Stellenbosch University. This research group is currently collaborating with industrial and academic partners on the application of these processing options for the conversion of lignocellulosic biomass into higher-value energy, chemical and material products, which require the optimisation of process conditions for specific biomass materials that are of industrial interest. This group has long-standing technical expertise in the processing of biomass materials, with some projects having progressed to industrial demonstration. Successful postgraduate candidates will be exposed to a network of industry participants, through on-going collaborations of the research group with industry partners, which hold the promise of future career development.

The postgraduate researchers will be expected to contribute significantly to:

A. Independent and safe operation of pilot-plant equipment for pyrolysis and steam-explosion pilot-plant equipment, in collaboration with other researchers that will participate in these experimental projects.

B. Critical evaluation of existing technology performances, based on published literature and previous experience in the research group, with proposals for technical development to improve these, taking the unique objectives of these research projects into account.

C. Provide technical support to other researchers in the group working on similar projects.

Successful candidates will be offered a minimum bursary of ZAR170 000 per year of study, for two years (research-based Masters) or three years (PhD). Successful candidates will be expected to complete the examination requirements for qualifications in these timelines, and can start postgraduate studies between July 2025 and January 2026. Provided that the necessary procedures are put in place, the

bursaries awarded for these postgraduate positions will be tax free. Bursaries are only available to full-time postgraduate students, and preference will be given to applicants that are South African citizens.

Requirements:

Applicants for the research-based Masters must hold a BEng or BScEng degree in Chemical Engineering from an accredited tertiary institution, and have good academic record (preferably with a course aggregate of >65%) and. Applicants for PhD studies must hold a research-based Masters of Engineering in Chemical Engineering degree from an accredited tertiary institution, with an academic record that will allow enrolment in the relevant academic program. Candidates with BTech, diploma or advanced diploma qualifications will not be considered for these positions. Candidates with previous experience in pilot-scale biomass processing, or microbial bioprocessing or anaerobic digestion of biomasses, will be a definite advantage but is not required. Preference will be given to South African citizens and permanent residents who display academic excellence.

Application:

Application documents: Closing date for applications is 31 July 2025. Interested candidates should provide a cover letter, CV, complete academic transcripts, and contact details of at least three academic references. All documents should be merged into a single PDF and attached to the application. Incomplete applications will not be considered. Applications can be sent to Prof. JF Görgens at jgorgens@sun.ac.za.

Stellenbosch University reserves the right not to fill the position.