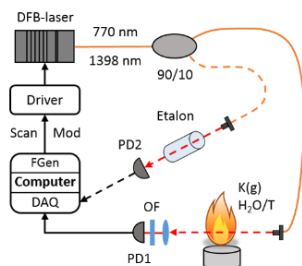


The [Applied Laser Spectroscopy Group](#) at the [Department of Applied Physics and Electronics](#), Umeå University announces thesis projects in the field

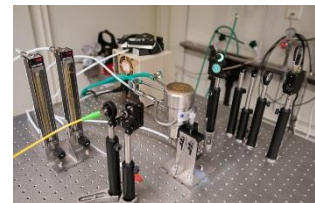
## Biomass combustion diagnostics using laser spectroscopy

Biomass becomes increasingly important as renewable, CO<sub>2</sub>-neutral energy source. However, the chemical composition of biomass evokes fine particle formation, which can lead to ash-related operational problems in industrial reactors and harmful emissions. To be able to mitigate these issues, the Thermochemical Energy Conversion Laboratory (TEC-Lab), part of the Department of Applied Physics and Electronics and the Chemical Biological Centre (KBC), conducts fundamental research on thermochemical conversion of biofuels.



The **Applied Laser Spectroscopy Group** develops laser-based spectrometers and techniques for fast and accurate detection of atomic and molecular species in gas-phase. The sensors are employed in applications such as real-time in situ combustion diagnostics and detection of biomarkers in exhaled breath for medical diagnostics.

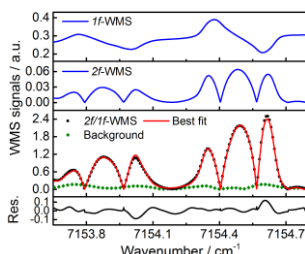
In cooperation with TEC-Lab, we have recently constructed and applied a robust spectrometer for simultaneous detection of potassium (K), water vapor (H<sub>2</sub>O) and gas temperature in flames and hot reactor flue gases, suitable to investigate biomass combustion and gasification on various processes scales.



**Thesis project 1:** Use the exiting sensor to conduct detailed parametric studies of biomass combustion in burner stabilized flat flames and a single-particle-reactor with the aim to validate experimental methods and improve theoretical models.



**Thesis project 2:** Further develop LabVIEW and MATLAB code for real-time curve fitting and analysis of the recorded absorption spectra. The aim is to extract species concentration and temperature in real-time during the experiments. This will optimize the existing spectrometers and facilitate process monitoring.



The projects are suitable for students who are interested in **lasers**, **spectroscopy** and (biomass) **combustion**, have experience with experimental work, and are familiar with **programming in LabVIEW** and **MATLAB**. The student will get acquainted with the existing laser spectroscopy setups and perform his/her own experiments. Thesis topics other than the above mentioned can be discussed.

For more information contact [Florian Schmidt \(florian.schmidt@umu.se\)](mailto:florian.schmidt@umu.se).