



PhD position in numerical modelling and computational fluid dynamics (CFD) simulation of carbonization process for an efficient biocarbon production (IV-214/19)

About the position

The Department of Energy and Process Engineering at the Norwegian University of Science and Technology (NTNU) is seeking a PhD student for the project knowledge-building project for industry (KPN), "BioCarbUp", funded by The Norwegian Research Council and industry partners. The project is led by SINTEF Energy Research, and involves several research institutions and industry partners. The candidate will be working in close cooperation with other PhDs and post-docs at EPT ComKin group, involved in similar activity.

Biocarbon (also known as biochar or charcoal) is a porous and carbonaceous solid made from biomass. The production of biocarbon usually involves heating biomass in the absence of oxygen or in lean oxygen conditions to a temperature above 300 °C with a residence time from minutes to days. During this process, hydrogen and oxygen are released from the biomass due to the dehydration and decarboxylation reactions. Therefore, the resulting biocarbon has a very high carbon content (above 90 wt% on an ash-free basis). This makes the biocarbon an ideal reducing agent for metallurgical processes for example Si and FeSi production. Traditionally, fossil coal and coke are used as reductants resulting in large CO₂ emissions from the metallurgical industry. The use of biocarbon as an alternative reductant can greatly reduce the CO₂ footprint. However, it is very challenging to achieve a cost-effective and sustainable biocarbon production. Furthermore, it is challenging to produce a product with the necessary mechanical characteristics for use in metallurgic processes. To address this, numerical modeling and computational fluid dynamics (CFD) simulation are chosen to gain insight of the conversion process of the biomass.

The head of the department is Professor Terese Løvås. The position's day-to-day project management and supervision is by Professor Terese Løvås and Dr Tian Li.

Main duties and responsibilities

The objective of the PhD work is to develop CFD tools for simulating biomass carbonizer. The work involves studies of detailed kinetic models for biomass pyrolysis as well as investigations of interactions between biomass particle, fuel bed, and fluid flows inside the reactor. Additionally, special emphasis will be on improving computational efficiency by using either advanced numerical methods including statistical approaches such as principal component analysis or hardware acceleration such as GPU. Matching the experimental data with results from CFD simulations will be an important part of the PhD project. In this part, close collaboration with other research partners within BioCarbUp such as SINTEF Energy Research and Hawaii Natural Energy Institute will be crucial.

Qualification requirements

The PhD-position's main objective is to qualify for work in research positions. The qualification requirement is completion of a master's degree or second degree (equivalent to 120 credits) with a strong academic background in chemical or mechanical engineering with a grade of B or better in terms of [NTNU's grading scale](#). Motivation for fundamental scientific research of practical relevance is essential. Genuine interest in mathematical modelling and programming is a prerequisite, but direct experience with code development in C++, CFD simulation of multiphase reacting flow, combustion modelling, and GPU programming will be prioritized.

The appointment is to be made in accordance with the regulations in force concerning State Employees and Civil Servants and [national guidelines for appointment as PhD, postdoctor and research assistant](#)

NTNU is committed to following evaluation criteria for research quality according to [The San Francisco Declaration on Research Assessment - DORA](#).

Other qualifications

- Good communication skills
- Good written and oral English language skills
- Norwegian language skills are an advantage

Personal characteristics

- Confidence in working independently and in teams
- Ability and willingness to work in inter- and transdisciplinary teams
- Creativity
- Critical thinking

In the evaluation of which candidate is best qualified, emphasis will be placed on education, experience and personal suitability, as well as motivation, in terms of the qualification requirements specified in the advertisement

We offer

- exciting and stimulating tasks in a strong international academic environment
- an open and [inclusive work environment](#) with dedicated colleagues
- favourable terms in the [Norwegian Public Service Pension Fund](#)
- [employee benefits](#)

Salary and conditions

PhD candidates are remunerated in code 1017, and are normally remunerated at gross from NOK 479 600 before tax per year. From the salary, 2 % is deducted as a contribution to the Norwegian Public Service Pension Fund.


The period of employment is 3 years (without required duties). Appointment to a PhD position requires admission to the PhD programme in Engineering, please see: <https://www.ntnu.edu/iv/doctoral-programme>.

As a PhD candidate, you undertake to participate in an organized PhD programme during the employment period. A condition of appointment is that you are in fact qualified for admission to the PhD programme within three months.

The engagement is to be made in accordance with the regulations in force concerning State Employees and Civil Servants, and the acts relating to Control of the Export of Strategic Goods, Services and Technology. Candidates who by assessment of the application and attachment are seen to conflict with the criterias in the latter law will be prohibited from recruitment to NTNU. After the appointment you must assume that there may be changes in the area of work.

General information

A good work environment is characterized by diversity. We encourage qualified candidates to apply, regardless of their gender, functional capacity or cultural background. Under the Freedom of Information Act (offentleglova), information about the applicant may be made public even if the applicant has requested not to have their name entered on the list of applicants.

Questions about the position can be directed to Terese Løvås, phone number +47 91897007 , e-mail terese.lovvas@ntnu.no.

About the application:

Publications and other academic works that the applicant would like to be considered in the evaluation must accompany the application. Joint works will be considered. If it is difficult to identify the individual applicant's contribution to joint works, the applicant must include a brief description of his or her contribution.

Please submit your application electronically via jobb norge.no with your CV, diplomas and certificates. Applicants invited for interview must include certified copies of transcripts and reference letters. Please refer to the application number IV-214/19 when applying.

Application deadline: 12.08.19

NTNU - knowledge for a better world

NTNU - knowledge for a better world

The Norwegian University of Science and Technology (NTNU) creates knowledge for a better world and solutions that can change everyday life.

Department of Energy and Process Engineering

We conduct research and teaching covering the entire energy chain, from resources to the end-user. We look at how energy is produced and used by humans and machines in a sustainable way with regard to health, climate change and the resource base. [The Department of Energy and Process Engineering](#) is one of eight departments in the [Faculty of Engineering](#).

Jobbnorge-ID: 173445, Søknadsfrist: Søknadsfristen er gått ut