TFM 1: Radiofrequency enhanced system for CO2 capture and utilisation.

The problem of global warming and climate change is critical considering the reports from EPA, PBL Netherlands Environmental Assessment Agency and the Department of Energy & Climate Change in the UK, outcomes from COP28 among others. Aiming at new developments and greener approaches is the next target. Carbon Capture and Storage and Utilization (CCSU) technologies also face the problem of high energy consumption and low efficiencies with current CCSU technologies. Chemical sorption with solid sorbents is one of the most promising processes to reduce the greenhouse effect, but it has the drawback of high energy consumption. Radiofrequency heating could overcome this considering its high efficiency. The use of electromagnetic energy to selectively heat magnetic materials acting as heating sources is well documented experimentally in chemical processes. Comparatively, little investigation has been conducted into the potential applications of radiofrequency (RF) heating, which may be surprising given its high depth of penetration, intrinsic safety aspects, high efficiency and low installation and operating costs. This kind of heating from 'inside-out' in the material, is transferred directly in the material bulk and it has been observed that it leads to a controlled, near isothermal operation of a reactor bed, which can improve yield, reduce hot spots and improve the overall stability of the system. That is why this Master thesis will be investigating different aspects within the project which the students can choose: optimization of control system with Labview, study and synthesis of different sorbents for capture system, study and synthesis of different catalysts for utilization system, energy analysis and optimization of the whole system. This Master thesis will be integrated in a national project and a PhD thesis.

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Position for one student.