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Coach	**Supervisor(s)**	**Funding**
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Thermodynamic equilibrium model for gasification of glass fibre reinforced plastics from decommissioned wind turbine blades (WTBs) using Aspen Plus

Aim

Develop a thermodynamic equilibrium model based on stoichiometric method integrating tar model for gasification of glass fibre reinforced polymers.

Justification

In this decade, Europe and Belgium will face two drastic transitions: an energy transition towards renewables and an economic transition towards circularity. In effect, these often go hand-in-hand, but in the case of WTBs, significant challenges are met at their end-of-life. Decommissioned WTBs are difficult to recycle and currently mostly landfilled. Recovering of materials and energy use are more preferable methods than landfilling. Recovering of materials from WTBs includes mechanical deconstruction for retrieval of metals, cutting and shredding of reinforced polymer matrix parts, thermochemical recycling, and energy use. Thermochemical recycling and energy use include pyrolysis and gasification.

In this study, the gasification performance of commercial end-of-life WTBs will be examined using stoichiometric thermodynamic equilibrium model built in Aspen Plus. The model will also include tar formation sub-model formulated using tar model compounds. Tar model compounds will be formulated based on previous pyrolysis experimental data. The model will be used to examine the effects of temperature, air-to-fuel equivalence ratio, and steam injection on gas compositions, gas yield, and tar yield.

Program

1. *Literature review*
   - *WTBs materials retrieval and their thermochemical processing*
   - *Gasification process models review*
2. *Development of gasification model in Aspen Plus*
   - *development of stoichiometric thermodynamic equilibrium model*
   - *development of tar reactions model*
3. *Investigate the effects of process operating conditions on gas composition, gas yield, and tar yield:*
   - *effect of temperature*
   - *effect of air-to-fuel equivalence ratio*
   - *effect of steam injection*