MODELING OF A HETEROGENEOUS SUPERCRITICAL OXIDATION REACTOR

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ABSTRACT

Hydrothermal oxidation is an efficient and clean technology for the treatment of wastewater containing organic compounds. So-called hydrothermal oxidation, these processes will be operated subcritical or supercritical way depending upon pressure and temperature conditions. The main advantage of these processes is that by-products are non-toxic. Indeed, organic material (C,H,O) is exclusively converted into carbon dioxide and water.

For the treatment of aqueous solid wastes, by hydrothermal oxidation, particle sizes are an important operating parameter. The presence of consumables solid particles requires to take into account both reaction at the surface of the particle and heat and mass transfer to the surface of that particle. We have developed a mathematical model for the scale-up of a polyphasique reactor in supercritical reactive media which can be treated by hydrothermal oxidation the waste loaded with consumables solid particles (farm-produce waste, agriculture).

In this aims, mathematical model based on stirred tank reactor and equations of mass, species, energy and population balances have developed. Thanks to this model, the temperature, size distribution of solid particle, concentration of waste and oxidant are computed. In parallel, we have developped a tank reactor for the treatment of aqueous wastes loaded with solid particles at a pressure of 25 MPa, temperature of 250°C to 550°C and flow rate of 1 kg/h in order to valid our simulation tool.