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Biogas from agro-industrial residues, combustion products evaluation by means of the thermodynamic equilibrium analysis approach

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In EU-28 more than 14,000 anaerobic digesters are operating in 2014, providing about 13.5 Mtoe of energy needs. In Italy in 2013 the biogas production has reached 1815,4 ktoe, while in Sardinia the biogas production is equal to the 4,5 % of the primary energy source, as highlighted in the last GSE Company report of the 2014. At present, the most common raw materials fed to the biogas plants are the energy crops (mainly triticosecale, maize silage) mixed with animal manure and sometimes with agro-industrial residues. However, the energy crops production requires an intensive use of land and occupies the soil potentially dedicated to the food crops. The use of the agro-industrial residues as a main feedstock for the anaerobic digestion plants can have a positive return on the process economy. It is also important to consider the environmental impact of the gases emitted during the biogas combustion. Thus, it is crucial to determine the composition of such gases. In this work, the Chemical Equilibrium/Applications program (CEA-NASA), treating one set of experimental data, collected by operating with an anaerobic digestion pilot plant, fed only with agro-industrial residues, was applied. Secondly, an experiment focused on the energy crops replacing with olives and sheep milk processing residues, was carried out. An energy crops replacement ratio of the 70% was reached. Moreover, the thermodynamic combustion equilibrium equation for the biogas produced by the different feedstock was derived. Finally the smoke composition and the conversion factor with several fuel-oxidant ratios were studied and discussed.

Biography

Agata Pistis is a chemical engineer; she has matured an experience working in a R&D unit of the unique carbon mine in Italy, where her activities were focused on studying of the thermochemical treatment process and desulphurization of coal. These activities were concluded with obtainment of an European patent. Currently, she is working in a Technology Park of Sardinia in a Biofuels and Biomass laboratory. She coordinates the start-up activities of a pilot plant scale reactor of the fast catalytic pyrolysis and fluidized-bed pilot gasifier. Moreover she carries out experiments on a pilot.

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