Theme, to be completed by the organizing committee

Integrated management and exploitation of multi-dispersed agricultural residues – application to energy production

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Agricultural residues include: a) the remaining matter of the harvests, b) materials collected during tree/vine pruning, c) the residuals of the agricultural industries, and d) wastes of the agricultural product processing chain. It is estimated that Greece produces about 3 million tons of olive trees prunings annually which are burnt releasing about 2.7 millions of CO_2 greenhouse gas emissions in the atmosphere. Alternatively, these prunings could annually produce 6.6 TWh of thermal energy or equivalently 2.3 TWh of electrical energy covering almost 4.8% of the total country's energy needs [1]. These figures show that the uncontrolled final processing of any of the produced agricultural residues may leave a serious environmental footprint and deprive the opportunity for a sizable contribution in the national energy supply.

Anaerobic digestion (AD) and pyrolysis (Py) are two basic biowaste-degrading technologies and have been studied for decades. In recent years, the integration of these two basic technologies into a single system has been brought up as a new conception [2]. Compared to the individual processes, this integration has the potential to offer great advantages in recovering bioenergy from agrowaste-biomass, reducing digestate management cost, recycling and reutilizing digestate and lowering greenhouse-gas releases. Additionally, enhanced performance of products obtained from the integrated processes has been observed, especially the strongly strengthened biochar's ability to fix heavy metals and nutrient elements. Each single process plays a key role in the integrated process, accelerating the decomposition rate of biomass and increasing the energy recovery efficiency. The integrated AD-Py concept has been used as leverage in promoting the concept of ''circular economy", aiming at the improvement of both the exploitation of the resources and operation efficiency. Moreover, the use of an integrated process may overcome defects in each individual process.

The SYNAGRON project proposes a new concept; not only the integration of anaerobic digestion with pyrolysis, but also their combination with the steam reforming reaction (SR) for the production of hydrogen rich mixtures (from biogas and bio-oil), which can pave the way for the commercial exploitation of biomass residues in a highly efficient and effective way.

References

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