TORREFACTION EXPERIMENTS FOR A VIABLE PRODUCTION OF SOLID BIO-FUELS FROM HAZELNUT INDUSTRY RESIDUES

Michele Miccio[1], Michela Fraganza[1], Paola Brachi[2], Renata Migliaccio[2], Blandine Tauleigne[3], Donatella Albanese[1], Stefano Giovanni Acierno[1], Aisylu Zainutdinova[4]

mmiccio@unisa.it

[1] Department of Industrial Engineering, Università degli Studi di Salerno - Via Giovanni Paolo II 132, 84084 Fisciano (SA), Italy

[2] Inst. of Sciences and Technologies for Energy and Sustainable Mobility, STEMS-CNR, P.le Tecchio 80, 80125 Napoli, Italy

[3] Department of Chemical Engineering, Clermont Auvergne University, Sigma Clermont, 20 avenue Blaise Pascal, 63178 AUBIERE CEDEX, France

[4] Dept. of Production Safety and Industrial Ecology, The Ufa State Aviation Technical University, Ulitsa Karla Marksa 12, 450077 Ufa, The Republic of Bashkortostan, Russia

Abstract

Hazelnut (Corylus avellana L.) is one of the most abundant tree nuts in human food. Turkey is the world leading producer, contributing over 72% to the global production, followed by Georgia, Spain and Italy. The Campania region has been the leader in the production of hazelnut in 2020, with about 480000 q and with less than half in the province of Avellino. The hazelnut skin (perisperm), hard shell (pericarp), green leafy cover/husk (floral bracts) and the hazelnut tree leaves are the by-products of roasting, cracking, shelling/hulling, and harvesting processes, respectively.

This work is part of a R&D project, with both lab-scale experiments and process simulation, aimed at valorization of the above non-edible parts. In particular, fresh hazelnut husks, which hold the hazelnut on the tree and remain attached to it in the early season harvesting, and cuticles from roasted Mortarella cultivar are considered; they are feedstocks yielding bioactive compounds (substances of chemical-food-pharmaceutical interest, such as the polyphenols as antioxidants) by extraction process and/or “renewable” solid fuels by thermochemical processing of residues.

This poster reports results of torrefaction as a “mild” thermochemical conversion process: experiments were carried out in a lab-scale, nitrogen-fluidized bed apparatus consisting of a tubular steel column, 38 mm ID and 350 mm high, surrounded by an electric heating tape, in *batch* mode with respect to biomass. Three temperature levels (200, 250 and 300 °C) are explored with a reaction time of 5 min. The results confirm the well-known trends in the literature that both the Mass Yield MY and the Energy Yield EY decrease with increasing torrefaction temperature. The fluidized torrefaction of such highly fragile materials is feasible and works smoothly. However, the feedstock is to be reduced from an original wide-cut size to a more processable size interval for fluidized bed operation, e.g., 2-4 mm.