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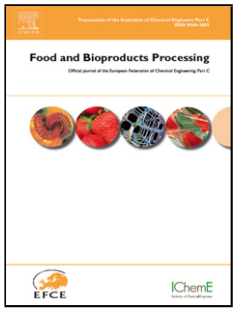

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ACCEPTED MANUSCRIPT

Simulation of spirits distillation for a better understanding of volatile aroma compounds behavior: Application to Armagnac production

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Note about figures: color is not strictly necessary for any figures in print.
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Green text: Modified phrases according to reviewer's comments

Highlights

- Simulation with ProSimPlus provides a consistent image of Armagnac distillation
- Aroma compounds can be classified in three groups: light, intermediary and heavy
- Variation of ethanol content in distillate modifies the aroma compounds composition
- Tails circuit favors the removal of intermediary and heavy species from Spirit

Abstract

A methodology for the simulation of Spirits continuous distillation was developed and applied to the analysis of an Armagnac unit, using the software ProSimPlus®. Distillation data for 66 aroma compounds were acquired during an experimental campaign and 32 of these species were simulated with the NRTL model, using interaction parameters estimated from equilibria data at high dilution.

Validation of static simulations against reconciled experimental data showed that the recovery of aroma compounds from wine to distillate can be predicted with good precision. Considering relative volatilities and composition profiles, three main groups of aroma compounds were proposed: (I) light compounds (recovered in distillate), (II) intermediary compounds (distributed between distillate and vinasse) and (III) heavy compounds (recovered in vinasse).

After validation of the nominal point, the influence of some operational parameters was investigated. According to simulation, three parameters, namely, tails extractions, ethanol concentration in distillate and distillate temperature, have a real impact on spirit composition. They enable a preferential reduction of intermediary and heavy species with respect to ethanol.

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