Nanoemulsification of a Plant-based Oil for Sustainable Crop Protection

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Sustainable and efficient crop protection is key to addressing the rising demand to feed the growing global population whilst ensuring minimal adverse environmental impact. Azadirachtin, a bioactive found in neem oil, is known to be effective on hundreds of species of insects; it is biodegradable with very low toxicity to mammals. Of the different aspects of the project relating to product and process development, efficacy testing and development of predictive tools, the proposed presentation focusses on the different protocols for the nanoemulsification of neem oil, continuing from studies at 50 ml[(1,2,3)]. The main objective has been to identify the kinetics of breakup upon scale up in batch and recirculation modes.

Dispersions of neem oil-in deionised water were prepared using an ultrasonic processor (Hielscher UP200S) at a concentration of 10%, in the presence of surfactants. The sonotrode was placed in a flow cell in the recirculation loop of a tank equipped with a 6-bladed disc turbine (6DT) at both 0.3 and 1 l. In batch mode, it was used with a 6DT in the tank.

Pre- and final dispersion homogeneity could be demonstrated. Effects of power input, in addition in the case of recirculation mode residence time were studied: increasing the power input, the time to reach equilibrium d_{32} is reduced (Figure 1). Residence time (RT) in the range of about 3 to 11 s does not appear to have a significant effect on the equilibrium diameter (Figure 2). Emulsion stability for over 10 days could be demonstrated. Further results will be presented at the Event.

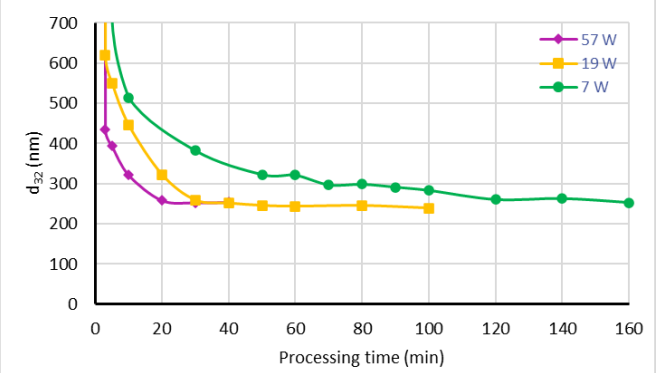

Figure 1. *Evolution of d_{32} (1 l; batch)*

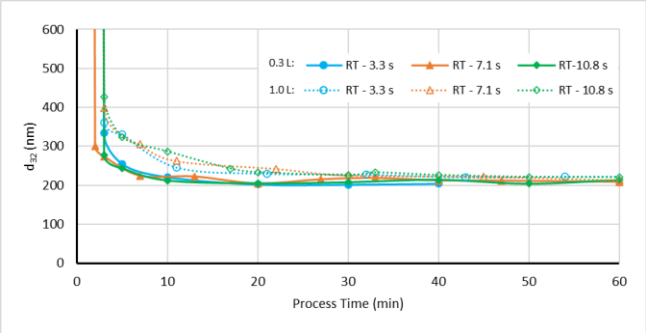

Figure 2. *Evolution of d_{32} at different flow rates (residence time values, RT) in recirculation mode*

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References

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