Poster GC16

Supercritical Extraction of Oil Seed Rape: Energetic Evaluation of Process Scale

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The supercritical fluid extraction of oil seed rape is potentially a large scale application of this technology that has been thoroughly studied [1, 2] and modelled [3], but still has not been industrially applied. The advantages of supercritical fluid extraction against conventional extraction methods are clear: shorter extraction times, avoidance of toxic solvents and solvent residues and purity of the final product. However, the main drawback of this process is the reluctance of industry to adopt new technologies. This technophobia combines with the current economic constraints on capital investment creating a difficult barrier to surpass. However, an accurate energetic evaluation of the extraction process at different scales will provide further evidence to encourage the change to supercritical fluid extraction.

This study focuses upon the supercritical CO_2 extraction of rape seed oil and the energy consumption associated with it. Several experiments have been carried out to determine the influence of pressure, temperature, and flow rate on the extraction yield. Four extraction scenarios have been evaluated: below the retrosolubility point, first generation supercritical plants, second generation supercritical plants and future third generation supercritical plants.

The experiments were carried out in the CO_2 laboratory of the Biocomposites Centre in Bangor University using a Thar 1L extraction plant and a Separex 2 ×16L pilot plant both fitted with comprehensive energy monitoring devices. Pressures were from 25.0 MPa to 70.0 MPa, while temperature ranged from 35 to 75°C. A conventional extraction with n-hexane was accomplished to determine the oil content in the seeds. The rapeseed was freshly pretreated in a roller mill.

The extraction yields are improved with pressure and temperature (beyond the retrosolubility point), while the energetic balance is clearly favoured when scaling up the process. These results show the feasibility of scaling rapeseed oil supercritical fluid extraction.

References

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