Title Mathematical modeling of caffeine kinetic during solid–liquid extraction of coffee beans

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Abstract

Rigorous and simplified models were proposed for caffeine kinetic description during the solid–liquid extraction process of coffee decaffeination. The evolution of caffeine concentration was measured both in extract and refined phases by gas chromatograph. The rigorous model is a non-steady diffusion equation for the coffee beans couple with macroscopic mass transfer equation for solvent. The simplified one is the analytical solution of macroscopic mass transfer equations for beans and solvent. In both models, rectangular coordinates were assumed. Caffeine internal mass diffusivity was estimated by fitting the simplified model to experimental results. The caffeine diffusivity in coffee beans yields $3.209 \times 10^{-10}\ m^2\ s^{-1}$ at 90 °C. The simplified model reproduce adequately the experimental kinetic of caffeine in both phases.