

Incorporation of the GEMs item: ***Liquid CO<sub>2</sub> extraction of D-limonene from orange peel*** submitted by James E. Hutchison into the General Chemistry curriculum.

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**Summary:** Using a simple device and dry ice, D-limonene is extracted from orange peel. This experiment is a student favorite! Dry ice is liquefied in a centrifuge tube and percolates through grated orange peel to extract limonene. As the CO<sub>2</sub> evaporates, the limonene is left at the bottom of the tube and can be measured and analyzed. Alternative solvents and natural product extractions are introduced for discussion.

This experiment allows the student to experience and visualize the phase diagram for CO<sub>2</sub> (including the triple point), as they watch solid CO<sub>2</sub> sublime, compress and liquefy. In addition to phases of matter, this extraction lends itself to discussions of polarity, solubility, alternative solvents and extractions. The product can be measured quantitatively, and can open up further experimentation and comparisons with other sources of limonene or extended to other essential oils extractions.