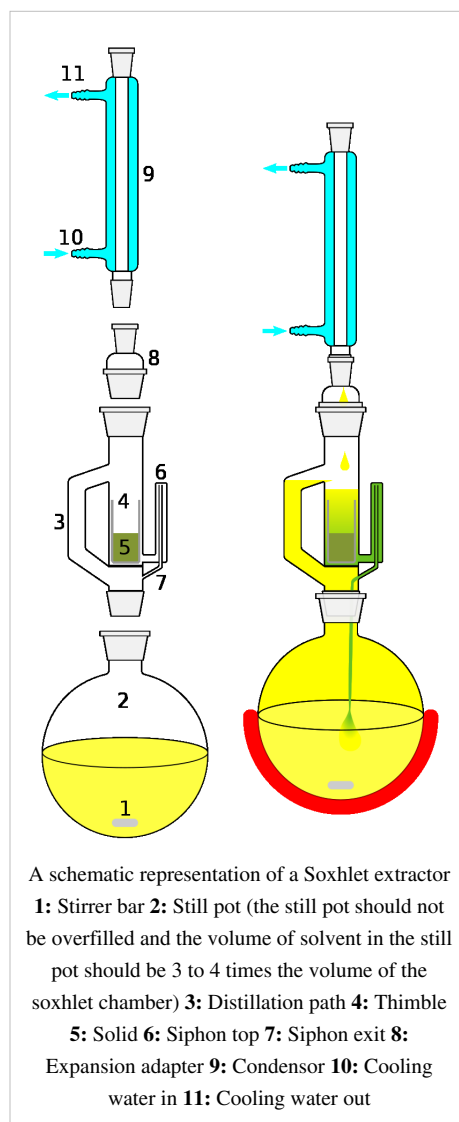
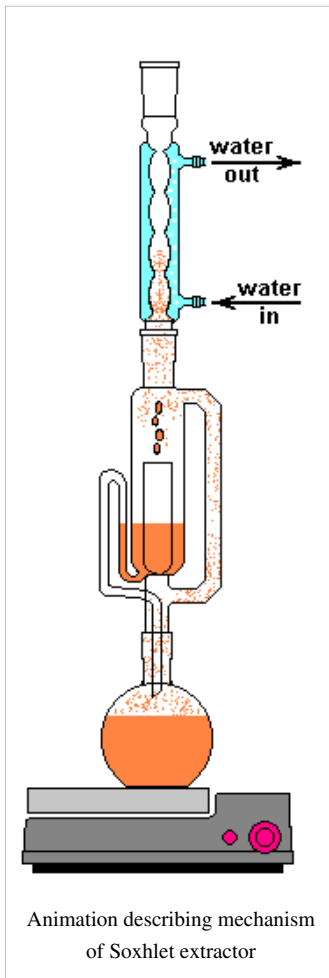


# Soxhlet extractor

A **Soxhlet extractor** is a piece of laboratory apparatus<sup>[1]</sup> invented in 1879 by Franz von Soxhlet.<sup>[2]</sup> It was originally designed for the extraction of a lipid from a solid material. However, a Soxhlet extractor is not limited to the extraction of lipids. Typically, a Soxhlet extraction is only required where the desired compound has a *limited* solubility in a solvent, and the impurity is insoluble in that solvent. If the desired compound has a significant solubility in a solvent then a simple filtration can be used to separate the compound from the insoluble substance.







Fruit extraction in progress. The sample is placed in the thimble.

Normally a solid material containing some of the desired compound is placed inside a thimble made from thick filter paper, which is loaded into the main chamber of the Soxhlet extractor. The Soxhlet extractor is placed onto a flask containing the extraction solvent. The Soxhlet is then equipped with a condenser.

The solvent is heated to reflux. The solvent vapour travels up a distillation arm, and floods into the chamber housing the thimble of solid. The condenser ensures that any solvent vapour cools, and drips back down into the chamber housing the solid material.

The chamber containing the solid material slowly fills with warm solvent. Some of the desired compound will then dissolve in the warm solvent. When the Soxhlet chamber is almost full, the chamber is automatically emptied by a siphon side arm, with the solvent running back down to the distillation flask. This cycle may be allowed to repeat many times, over hours or days.

During each cycle, a portion of the non-volatile compound dissolves in the solvent. After many cycles the desired compound is concentrated in the distillation flask. The advantage of this system is that instead of many portions of warm solvent being passed through the sample, just one batch of solvent is recycled.

After extraction the solvent is removed, typically by means of a rotary evaporator, yielding the extracted compound. The non-soluble portion of the extracted solid remains in the thimble, and is usually discarded.

## History

William B. Jensen notes<sup>[3]</sup> that the earliest example of a continuous extractor is archaeological evidence for a Mesopotamian hot-water extractor for organic matter dating from approximately 3500 BC. Before Soxhlet, the French chemist Anselme Payen also pioneered with continuous extraction in the 1830s.

## References

- [1] Laurence M. Harwood, Christopher J. Moody. *Experimental organic chemistry: Principles and Practice* (Illustrated edition ed.). pp. 122–125. ISBN 978-0632020171.
- [2] Soxhlet, F. Die gewichtsanalytische Bestimmung des Milchfettes, *Polytechnisches J.* (Dingler's) 1879, 232, 461
- [3] *The Origin of the Soxhlet Extractor* William B. Jensen Vol. 84 No. 12 December 2007 • *Journal of Chemical Education* 1913

## External links

- The Soxhlet Extractor explained. (<http://www.campbell.edu/faculty/jung/soxhlet.ppt>)
  - Royal Society of Chemistry: Classic Kit: Soxhlet extractor: (<http://www.rsc.org/chemistryworld/Issues/2007/September/ClassicKitSoxhletExtractor.asp>)
  - Soxhlet apparatus used as a replenishing source of solvent in chromatography. ([http://pipeline.corante.com/archives/2008/02/21/new\\_tricks\\_with\\_glassware.php](http://pipeline.corante.com/archives/2008/02/21/new_tricks_with_glassware.php))
  - Solutions for automated Soxhlet extraction. (<http://www.buchi.com/BUCHI-automated-extraction-sys.17815.0.html>)
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