# BEER QUALITY

## Beer Quality / Analytical Chemistry

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### Technologies

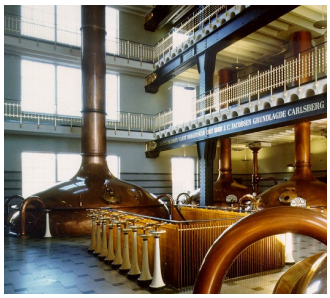
The Beer Quality Group at Carlsberg Research Center masters advanced analytical techniques with focus on characterization of flavor components. We perform gas chromatography with flame ionization detection (GC-FID), sulfur chemiluminescence detection (GC-SCD) and mass spectrometric detection (GC-MS); liquid chromatography with mass spectrometric detection (LC-MS) or UV detection (LC-UV); capillary electrophoresis (CE); and supercritical fluid extraction (SFE)

### Projects

The Beer Quality Group deals with establishment of new chemical analysis for characterization of beer - with focus on flavor and flavor stability. Beer is a very complex matrix comprising myriads of components originating from the raw materials (malt, water, hops or adjuncts) or produced by the yeast during the fermentation. To characterize beer, a large battery of chemical analyses is needed. The analyses are used for studying the effect of various raw materials, yeast strains or brewing processes on the composition of the beer.

Beer is a very fragile liquid that will deteriorate rapidly unless stored under cold and dark conditions. The stale "cardboard" flavor, which may appear upon storage, is mainly due to very small amounts of trans-2-nonenal, a lipid degradation product formed during malting and wort production. The Beer Quality Group examines the brewing process - from malting to beer pasteurization - to pinpoint the critical steps of lipid oxidation.

The Beer Quality Group also supplies the various research groups at the Carlsberg Research Center, the maltsters and the brewers with tailor-made analyses to support the activities in barley- and yeast breeding, product development, process optimization, and trouble-shooting.



### Results

Several chemical analyses have been established to support research and product development and to solve ad hoc problems within the Carlsberg group. A method for quantification of $SO_2$ by GC-SCD is now used daily by Carlsberg Breweries, and routine determinations of pesticides residues in malting barley secure that the raw materials meet the high purity standards, required by Carlsberg.

Based on systematic examination of the brewing process a list of recommendations how to improve flavor stability during transportation and storage under suboptimal conditions has been issued, especially with focus on trans-2-nonenal.