Introduction (excerpt from Vesely et al, 2003)

Carbonyl compounds, particularly aldehydes, are considered to play an important role in the deterioration of beer flavor and aroma during storage. Strecker degradation of amino acids, melanoidin-mediated oxidation of higher alcohols, oxidative degradation of lipids, aldol condensation of short-chain aldehydes, and secondary oxidation of long-chain unsaturated aldehydes are mechanisms implicated in their formation [1]. Their levels in beer are usually very low, and therefore it has always been a challenge for brewing chemists to develop an analytical method that would enable routine analysis of aldehydes.

Several analytical methods for the determination of aldehydes in beer have been developed, and good results have been obtained using liquid–liquid extraction [2], distillation [3], or sorbent extraction [4]. However, these methods are rather complicated and not highly selective.

A simple way to increase the selectivity of extraction techniques is to derivatize the carbonyl compounds. O-(2,3,4,5,6-Pentafl uorobenzyl)hydroxylamine (PFBOA) is commonly used as a derivatization agent in gas chromatography [5]. This technique has been applied to the analysis of carbonyl compounds in water and also in beer [6]. Although these methods provide good reproducibility, they are time-consuming and require use of solvents, materials for the derivatization, and isolation steps. Martos and Pawliszyn [7] developed an original extraction technique based on PFBOA on-fiber derivatization of gaseous formaldehyde followed by gas chromatography with flame ionization detection.

In this work, we adapted a method for the analysis of beer aldehydes using solid-phase microextraction (SPME) with on-fiber derivatization. This extraction technique does not require solvents, consists of a one-step sample preparation procedure, and provides high sensitivity and reproducibility. It enabled a detailed study of aldehyde level changes during packaged beer storage.