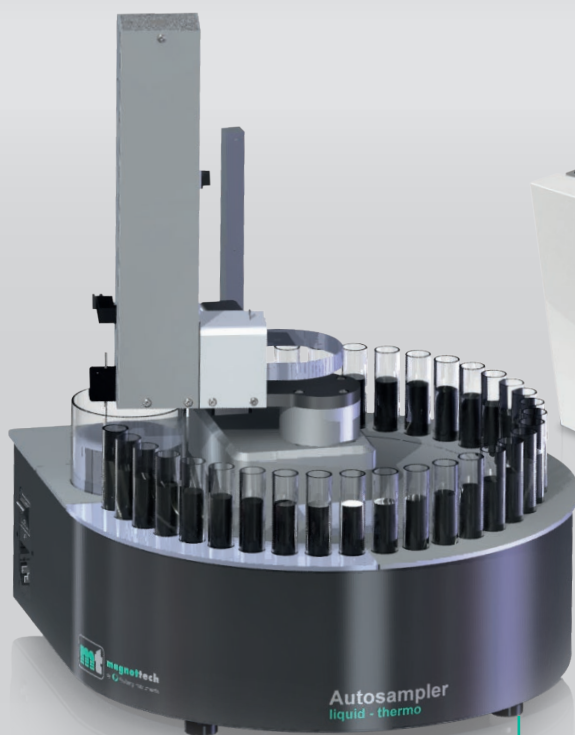


Beer Analysis

using MS 5000 Bench-Top ESR Spectrometer



facts

- Fully automated handling of samples
- Up to 30 samples per analysis
- Temperature control up to 70°C
- Automatic EAP and BAX calculation
- State-of-the-art and user friendly software



synopsis

The determination of the Endogenous Antioxidative Potential (EAP) and the Beverage Antioxidative index (BAX) using Electron Spin Resonance Measurements (ESR) is an ideal tool for the evaluation of the beer's oxidative flavor stability and shelf time. The bench-top ESR Spectrometer MS 5000 along with the novel Autosampler unit allows a fully automated measurement of these values.

Beer Analysis Technique

Due to the chain reaction of beer-derived free radicals, carbonyl end products like aldehydes and ketones are created, which cause the staling of beer. However, the endogenous antioxidants inhibit the free radical oxidation until they are depleted. Hence this free radical oxidation can be minimized by optimizing brewery operations and storage conditions to provide maximum antioxidant content on the packaged beer.

At each stage of the brewing process the comprehensive antioxidant status of the beer can be determined by ESR measurement and the determination of the EAP- and BAX value. In this way, the shelf life and flavor stability of a finished beer can be determined at the initial stages of brewing process i.e. before packaging and distribution.

ESR EAP and BAX evaluation

The EAP measurement is based on the indirect detection of the radical generation in beer during accelerated beer ageing at raised temperatures (60°C). The formed short-lived reactive radicals can be monitored by trapping them with spin trap reagents (POBN) and the detection of the long-lived spin trap adducts using the MS 5000 Bench-Top ESR spectrometer. For a certain period of time, the radical generation is delayed or prevented by the beer's endogenous anti-oxidative activity (lag-phase). After the lag phase the amount of spin adducts begins to increase rapidly. The EAP value is a measure for the duration of the lag phase and hence a beer with a high EAP value has a long flavor stability and vice versa.

Figure 1 demonstrates such an EAP determination of beer after the addition of different amounts of SO₂. The novel EAP value is linear dependent of the SO₂ content (Fig. 2) and offers a new beneficial index number for the evaluation of the flavor stability; the so called Beverage Antioxidative index (BAX). The BAX provides additional information about the anti and prooxidative properties of the beer matrix regardless of the SO₂ content and gives information of the consumption rate of the existing Antioxidative potential during storage. With the MS 5000, its Autosampler unit and the comprehensive software both values (EAP and BAX) can be measured fully automated and with high precision.

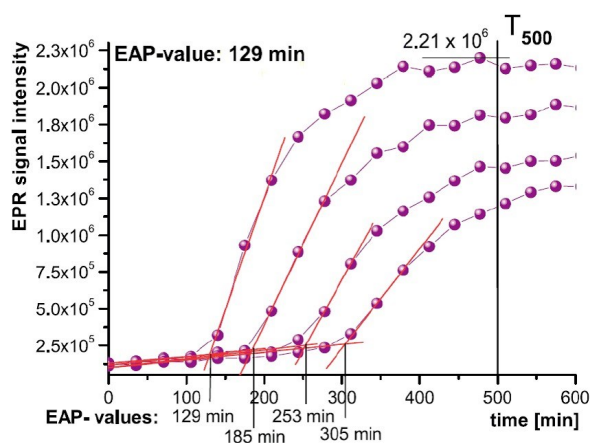


Fig. 1: ESR measurement of beer, EAP after SO₂-addition of 0,2,4,6 mg/L

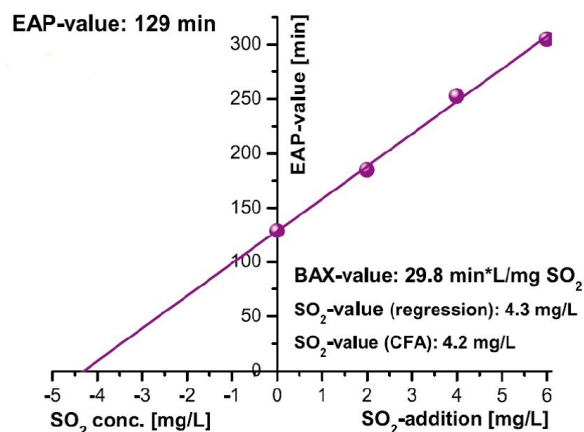


Fig. 2: BAX evaluation by linear fit of EAP values (BAX = slope)

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