

Nephelometric titration of macromolecular beer complexes using Turbidimeter

Tannoid content test (according to prof. Chapon) by using model TurbiLab

Principle:

The tannoids are defined as the fraction of polyphenolic compounds which are capable of forming insoluble complexes with proteins. Tannoids include the low and medium molecular polyphenols, the polymers of catechin and anthocyanogens. They come from the malt and hops. Although present at relatively low concentration, they play an important part in the colloidal and taste stability of beers. On the one hand they can precipitate the sensitive proteins of the wort and beer, on the other hand they act as protective agents.

The tannoid content of beer, wort, barley, malt and hop extracts can be determined by precipitation with polyvinylpyrrolidone (PVP). This polymer which can be considered as a structural analog of proteins binds with tannoids by hydrogen bonding to give an insoluble complex which leads to the formation of a haze.

On continuous injection of a solution of PVP into the sample a haze develops until all the tannoids are bound. Beyond this point an excess of PVP brings about a progressive dissolution of the haze.

The amount of PVP necessary to reach the maximum haze is proportional to the tannoid content of the sample.

Field of application

The method can be used to monitor the effectiveness of beer stabilisation treatment and results gives an indication of the probable shelf life of beer.

Apparatus:

Turbidimeter, PC with controlling software MZN Control, syringe pump pipette (for 6 ml volume), pipette (0.5 ml volume)

Reagents:

Polyvinilpyrrolidon (m.w. 360000 - PVP K90) water solution: 0,4 g/l
Saturated Amonium Sulphate Solution

Procedure:

Connect the turbidimeter to PC, connect the pump to supply and to PC.

Switch all instruments on and start the software MZN-Control on PC. Select the type of measurement in the software: *Titration – Measurement – PVP test* and check (or fill in) the table for individual parameters of measurement:

Sample container: cuvette

Number of measurements: 100 (increase when higher tannoid contend is expected)

Measuring interval: 00:00:20;

Starting dose: 0;

Dosage: 3.1 ml/hour; (according to pump calibration)

Sample volume: 6 ml

Infuse the syringe with PVP solution, connect to the hose of dosing assembly, gently press the piston to eject solution into the whole hose. Prepare the dosing pump according to manual (differs for different type of dosing pump). Place the dosing assembly tip to the separate test tube for the drain.

Pipette 6 ml of degassed beer into the measuring test tube, put the appropriate magnetic bar in, insert the test tube into the turbidimeter measuring chamber and let approx. 10 minutes to mix and stabilize temperature.

Gently wipe the dosing assembly tip and place it into the test tube containing the sample. Start the measurement procedure from the PC software.

When the measuring process starts the sample haze value is automatically measured in dependence on time at the simultaneous dosing of PVP solution into the sample. The curve of haze changes in dependence on PVP content in the sample is drawn on the display. (Measurement may be stopped at any time by the PC keyboard.)

Evaluation of results:

Automatic evaluation:

Switch "Automatic results" on (window - "Measurement – PVP test") before the measurement start. Test results will be automatically recalculated and stored in the data file just after the measurement ends.

Automatic evaluation (viewing mode)

Start the viewing mode in MZN-Control, open required file which includes measured data (the measured data are drawn on display). Select "Functions – PVP result" item. The resulting value is displayed and can be stored directly into the file results

!!! Attention !!! – If "Automatic evaluation" fails use manual evaluation

Manual evaluation:

Start the viewing mode in MZN-Control, choose appropriate file (with measured data), open it and the measured data are drawn on display. Select *scan* and determine the position of the curve maximum (Use arrows to move the cursor line). The resulting value can be stored directly into the file by "results" item.

Results of the tannoid content are expressed in mg PVP/liter of the sample to 1 place of decimals.

Result example: Tannoid content = 37 mg/l

Turbidimeter – PVP H(90)

