dithiocarbamate Na se décompose en milieu acide, perd son efficacité pH < 6.

Subject: Stability of SDMC as a function of pH and temperature

Date: 31-08-2005

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Introduction

In the first part of a sugar production process the sugar beets are washed, sliced and extracted. During this process the presence of bacteria will lead to the inversion of sugar. Perkacit SDMC can prevent this and consequently increase the sugar yield.

In principle the sugar production process from sugar beets is the same for different companies, although the production circumstances might be different. In the first part of the process the temperature and pH are variables as well as the residence time of the SDMC in this part of the production process.

An example:
During washing the pH is 6.5-7.5 and the temperature about 30-40°C, the time is unknown. In the slicing step biocides like SDMC are introduced. During slicing the pH will decrease due to the released lactic acid from the beats. Temperature will be between 50 and 70°C, the time is unknown. In the diffuser the sugar will be extracted. At this stage the pH is adjusted to 4.6-5.5 From discussions with customers pH values of 7.5-8.0 will also occur.

For that reason we did some tests at different pH (4, 6 and 8) and temperatures (50 and 70°C) and followed the SDMC concentration over time.

Experimental

- A solution of ca. 1000 ppm SDMC was prepared by adding of 0.5 g SDMC 40wt% into 200 g demiwater.
- The solution was heated up to the desired temperature.
- When the desired temperature was reached the solution was brought to the desired pH by adding of either diluted H2SO4 or NaOH solution (depending on the desired pH).
- When both the desired temperature and pH were reached a starting sample (t=0) was taken. Thereafter, samples were taken after intervals of time. During the experiment the pH was controlled by adding of diluted H2SO4/NaOH
- The samples were cooled down and analyzed (immediately) by NMR

It was planned to measure the stability of SDMC at 50 and 70°C and at 3 different pH values: 4, 6, and 8

Results

time	NGN05043 **pH=4, 50°C**	NGN05044 **pH=6, 50°C**	NGN05045 **pH=6, 70°C**	NGN05046 **pH=8, 70°C**	Remarks
min.	SDMC, ppm	SDMC, ppm	SDMC	ppm	
0	222	769	430	863	Starting concentration was lower than 1000 ppm because part of SDMC was already degraded during heating up and pH correction
5			87		
10			0		
15	0	288		911	
30		94		872	
45		40			
60		16			
75				869	
240				898	

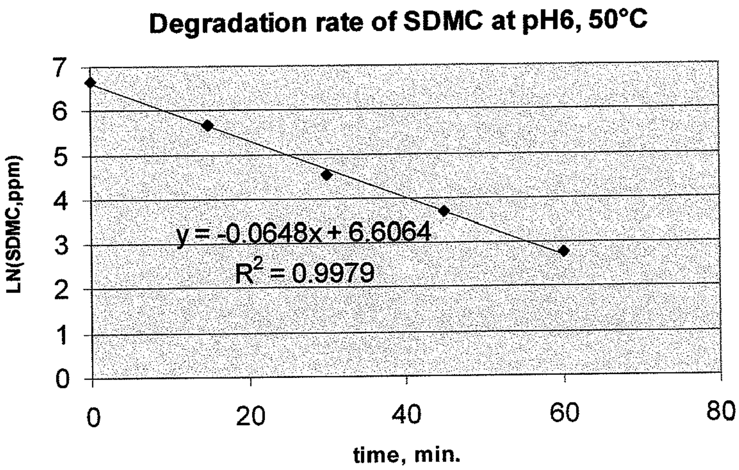
dès pH = 6 ↳ si pH basiq., T° dégrade
~~dégradat° du~~ peu pdt

pdt en 99 min

pH=4

The results show that SDMC is degraded very fast at this (low) pH. As all SDMC already disappeared within 15 min., the half life ($t_{1/2}$) of SDMC at this condition (pH4, 50°C) is ca. 2min.
Because of this fast degradation, measurement at 70°C is not possible.

pH=6



The above graph shows LN(SDMC) as a function of time. The result shows that the degradation of SDMC fits a first order reaction very well. The half-life ($t_{1/2}$)at 50°C is = LN2/k = 0.693/0.0648= 10.7 min.
At 70°C, all SDMC was degraded within 10 min. Estimation with the available results gives a ($t_{1/2}$)at 70°C of ca. 2 min.

These results also show that the degradation of SDMC is doubled when the temperature is increased with 10°C.

pH=8
SDMC is almost not degraded at pH8. Even at 70°C no changing of concentration was observed. Because of these results no measurement was performed at 50°C.