



Factors Influencing Wet Look of Clear Coatings on Wood

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SHR Timber Research

Outline

- introduction
- scope / plan of work
- results / practical issues
- conclusions / questions / feed back?

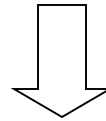
Introduction (1)

Safety and health covenant

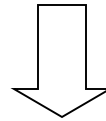
- agreement between social partners
- 2002 - 2006
- reduction of VOC exposure: VOC scans
- afterwards: restriction on the use of solvents

Introduction (2)

database



products linked to certain use



depending on ***demands***
alternatives with less VOC can be
suggested for specific uses

Scope

- objectivate the term Anfeuerung
- be able to measure Anfeuerung
- understand more about mechanism
- be able to point out low VOC alternatives to the furniture industry

Plan of work

- literature search for Anfeuerung
- point out measurable parameters
- collect samples to test practical use
- simple test procedure for further testing

Literature search

- two publications were found:

Riemann, S. (1993) Entwicklungsstand der wässrigen Lackierung von Möbeln und Schreinerartikeln, Industrie Lackierbetrieb, Vol. 61 Nr. 8, pag. 291 - 294

Berkhout, L. and Baah, F. (2004) New Waterborne Polymer with Improved “Anfeuerung” for Medium/High Quality Wood Furniture, Advances in Coatings Technology (ACT’04), 23-26 November 2004, Warsaw

Anfeuerung (1)

- Riemann defined Anfeuerung as the effect that the natural colours of wood become more intense after application of a lacquer
- factors involved:
 - wetting of the wood pores
 - swelling of the wood
 - rheological behaviour (morphology)

Anfeuerung (2)

- Berkhout: widely accepted German expression to describe the optical performance on wood:
grain structure of the wood, wood grain, wet look, depth of image (3D-effect)
warmth of the wood, reddish appearance, enhancement of the natural beauty of wood

Anfeuerung (3)

- working definition for Anfeuerung:

the intensification of the natural colours of wood and increase of contrast after application of a lacquer similar as brought about by wetting the wood with water (wet look)

Measurable parameters

- parameters involved in coating application should be excluded so binder and coating formulation specific effects can be assessed
- contrast
- colour compared to wet look

Colour measurement

- Minolta Spectrophotometer C2600
- both coated wood and freshly wetted wood were measured
- delta E value was calculated from the mean value for five measurements at the same spot.
- Specular Component Excluded (SCE)

Test for usefulness

Five commercial products were selected:

1. VOC 2K PU
2. VOC NC lacquer
3. Waterborne acrylic A
4. Waterborne 2K PU
5. Waterborne acrylic B

Visual assessment and colour measurement (Beech)

Beech	best		>>>					worst	
Contrast	3	>	2	>	1	>	4	>	5
Colour	2	>	1	>>	4	>	5	>>	3
Overall	2	>	1	>>	4	>	5	>>	3
Delta E	2		1		5		4		3
	(2.7)		(5.7)		(7.6)		(9.5)		(10)

Visual assessment and colour measurement (Oak)

Oak	best >>> >>> worst								
Contrast	2	>	4	>	1	>	5	>	3
Colour	2	>	1	>	4	>	5	>	3
Overall	2	>	1	>	4	>	5	>	3
Delta E	2		1		4		5		3
	(1.7)		(2.2)		(4.3)		(4.5)		(6.3)

Visual assessment and colour measurement (Cherry)

Cherry	best		>>>					worst	
Contrast	2	>	1	>	4	>	3	>	5
Colour	2	>	1	>>	4	>>	5	>	3
Overall	2	>	1	>>	4	>>	5	>	3
Delta E	2 (1.8)		1 (3.2)		4 (5.9)		3 (7.1)		5 (9.5)

Conclusions so far

- clearly different results for visual assessment of contrast and colour/overall impression
- colour/overall impression corresponds to colour measurements
- nice result to carry on with...

Change of pH coating formulation

Binder /additive	Wt-% added
binder	85.4
defoamer	0.5
cosolvent 1	2.6
cosolvent 2	2.6
thickener	0.8
defoamer	0.1
water	8.0
	100.0

Change of pH Beech samples



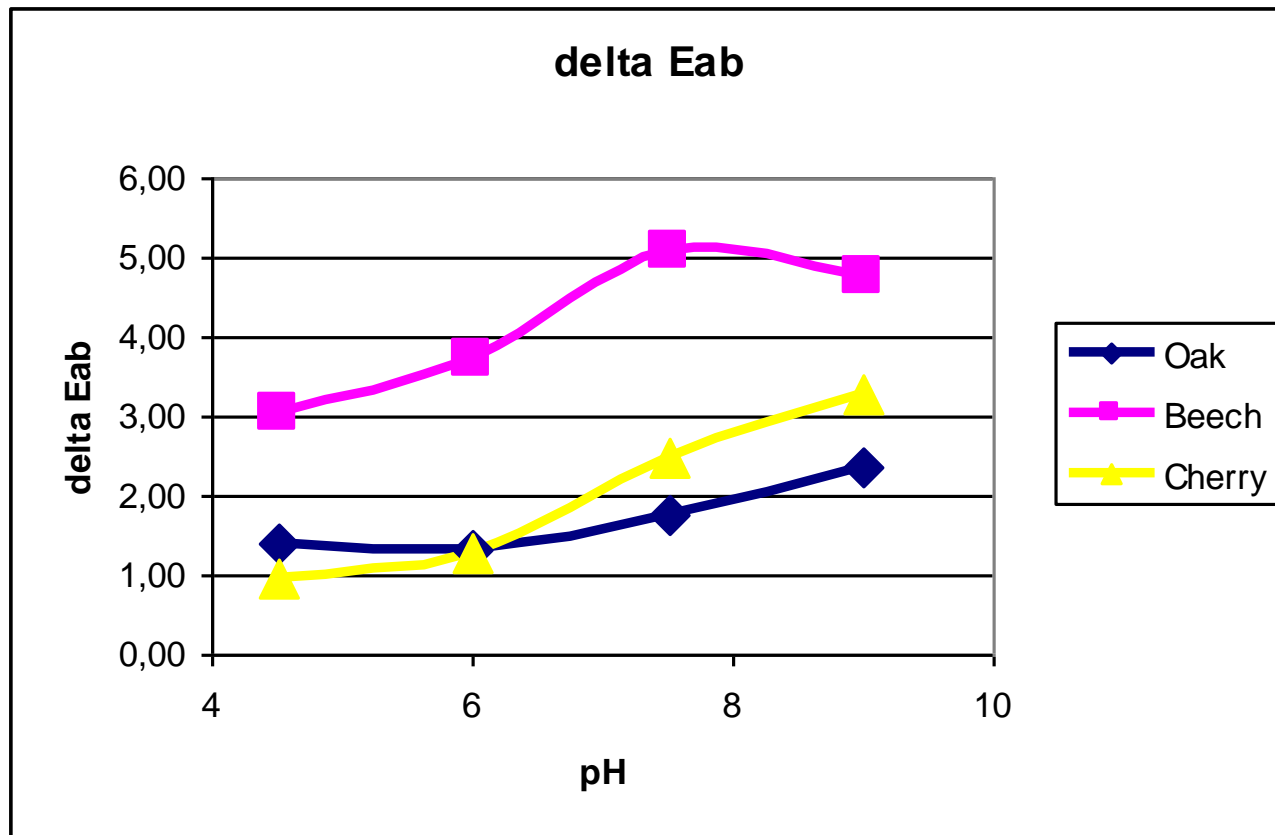
Change of pH Oak samples



Change of pH Cherry samples



Change of pH colour measurement



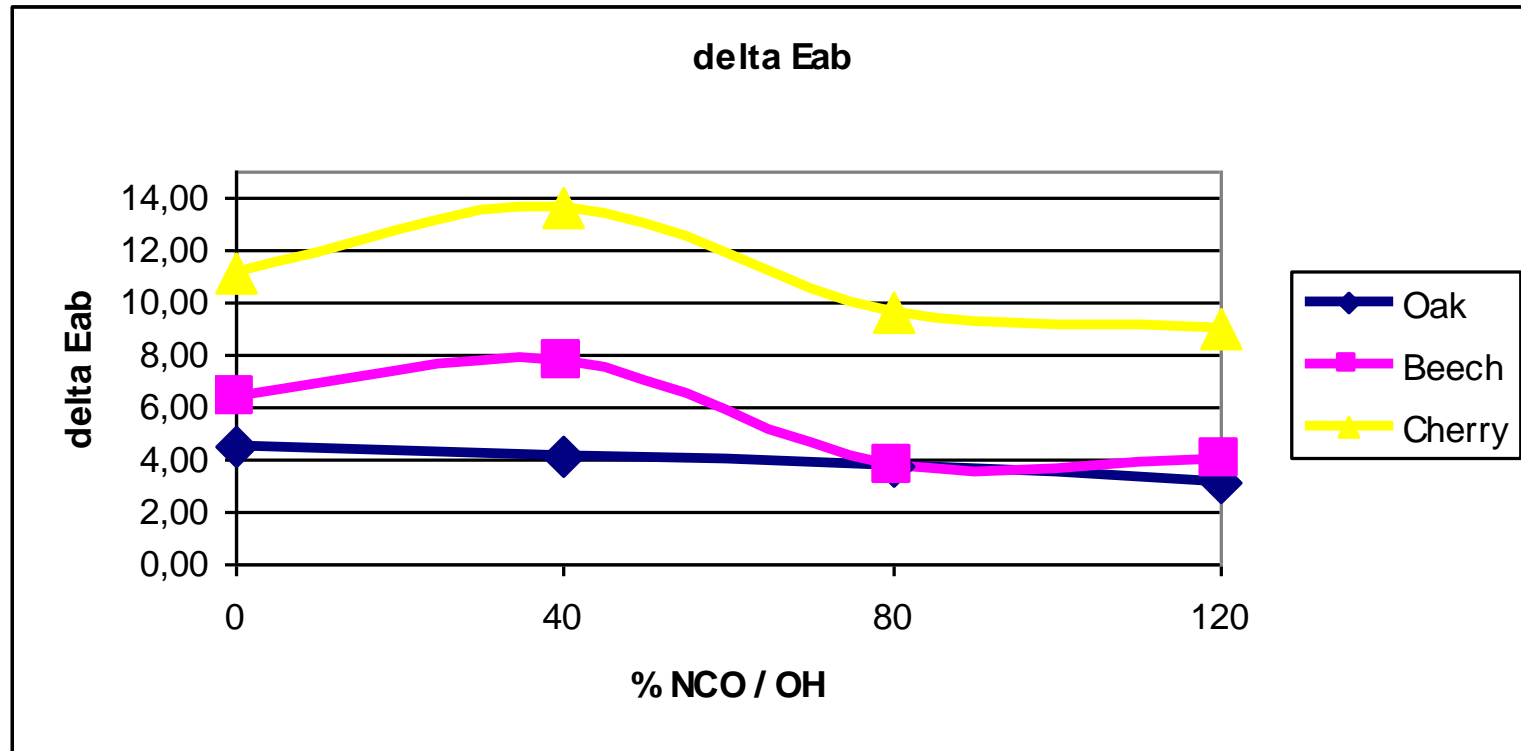
Change of pH visual assessment

- change in colour was noticed but not as strong as the measurements suggest
- contrast was (again) assessed differently from colour and more important for the overall impression

Change of NCO/OH ratio coating formulation

NCO/OH ratio	K2 [g] added per 100g K1	Cosolvent [wt-%]
0	0.0	5.2
0.4	12.0	6.4
0.8	24.1	7.3
1.2	36.1	8.1

Change of NCO/OH ratio colour measurement



Change of NCO/OH ratio visual assessment

- colour was equal
- contrast increased with increasing NCO/OH ratio
- overall impression comparable to results of contrast

Conclusions (1)

- reproducibility of the method is not satisfactory in some cases
- the method needs to be optimised to increase reproducibility
- the method can't discriminate when differences are barely visible

Conclusions (2)

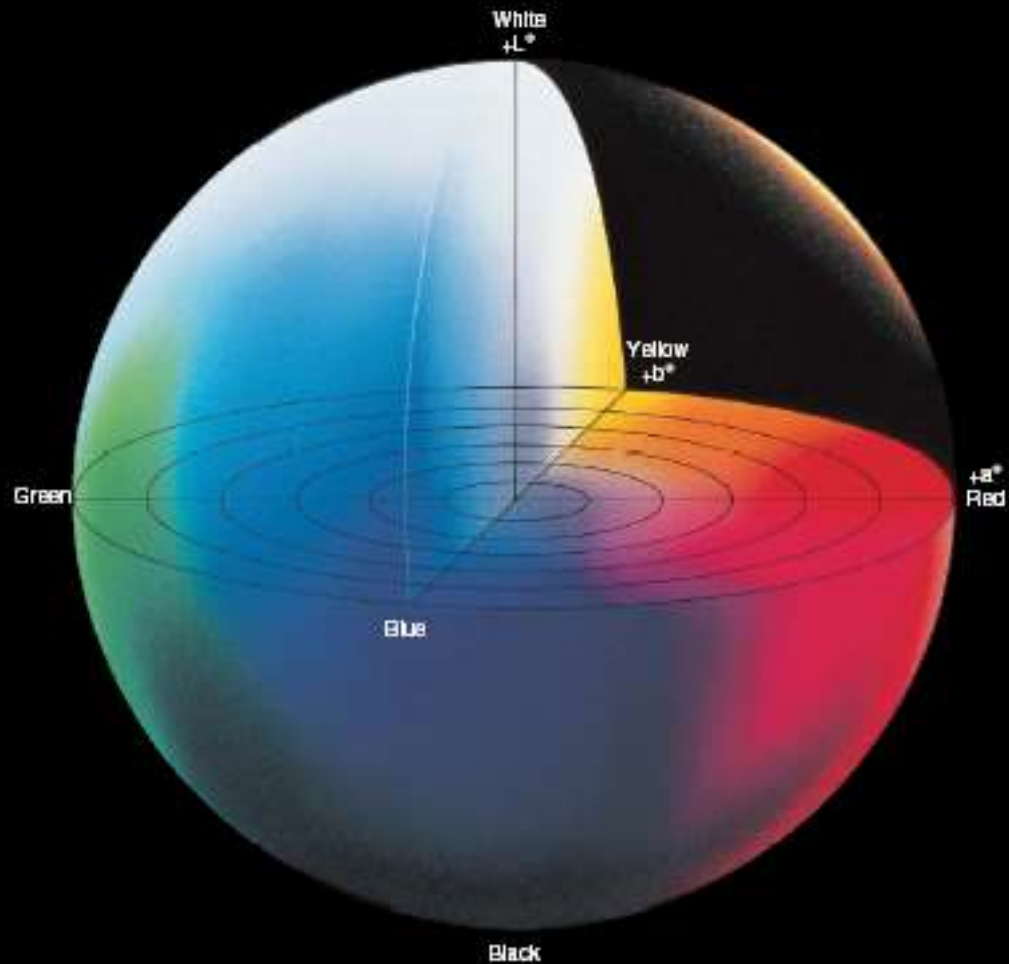
- therefore, for now, the method can be used only for ordering coatings on wood in classes of Anfeuerung (good, possibly good or bad)
- the method, when optimised, can be useful for quick screening purposes (waterborne alternatives or formulation)

Future work

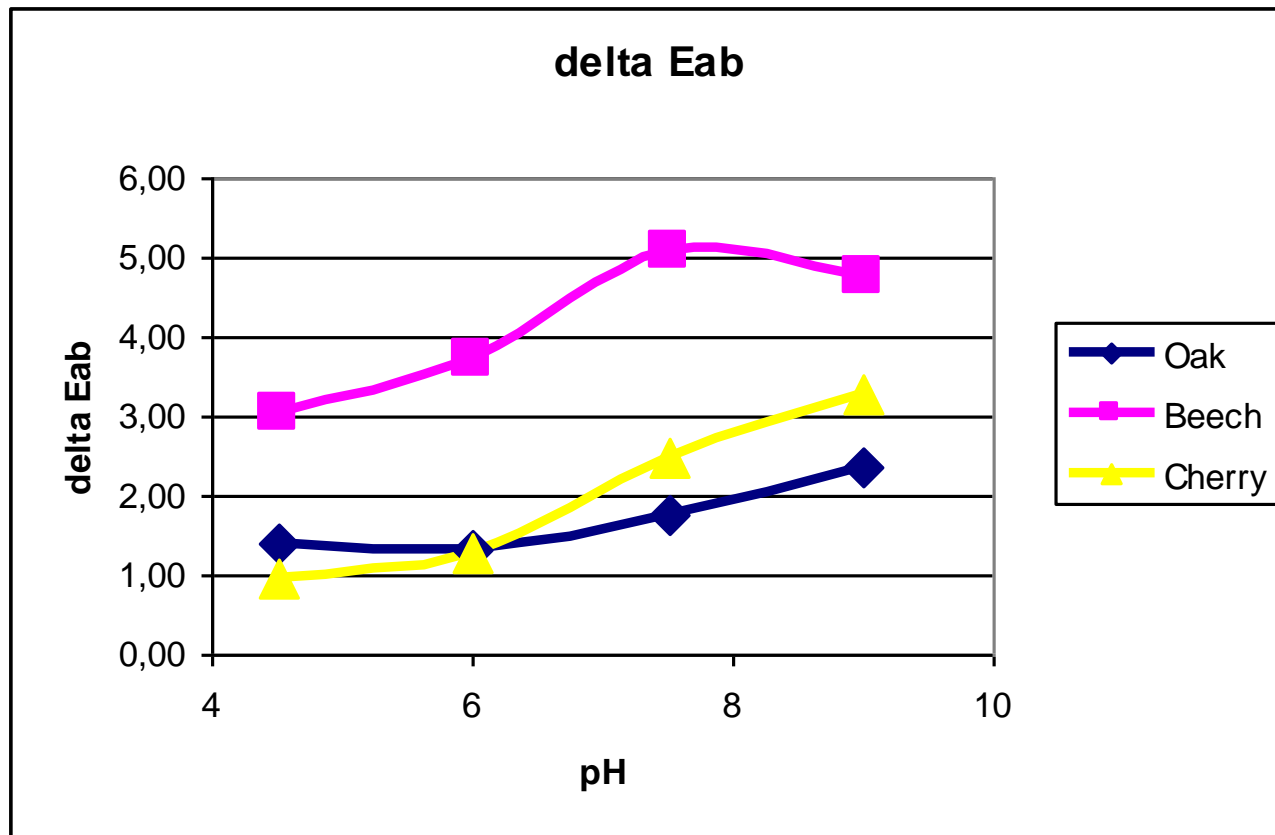
- more coatings and in greater numbers should be measured to optimise the method and increase reproducibility or to gain insight in the actual reproducibility
- an objective method to measure contrast differences can be considered to be a necessary addition to colour measurement



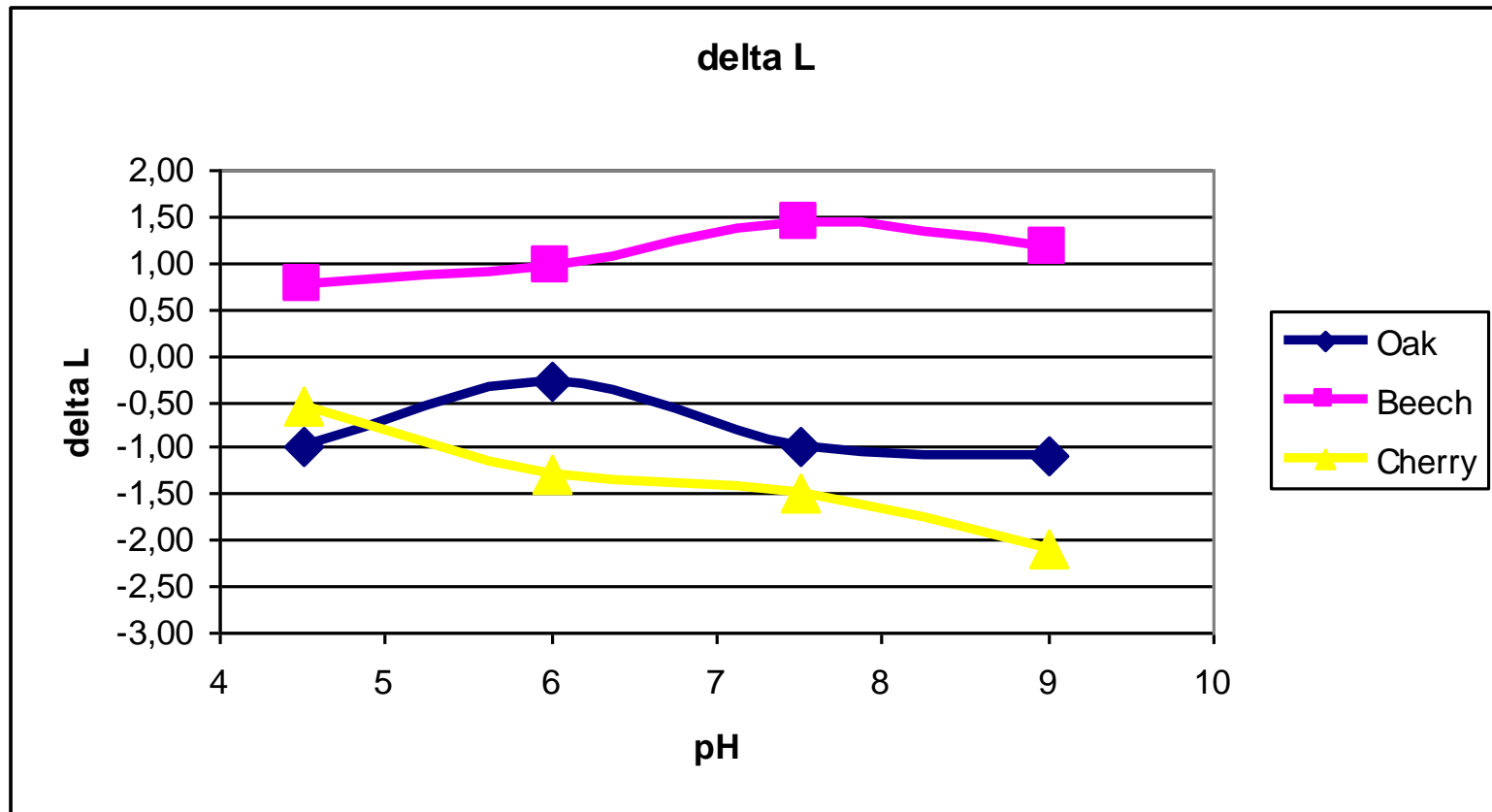
Colour measurement



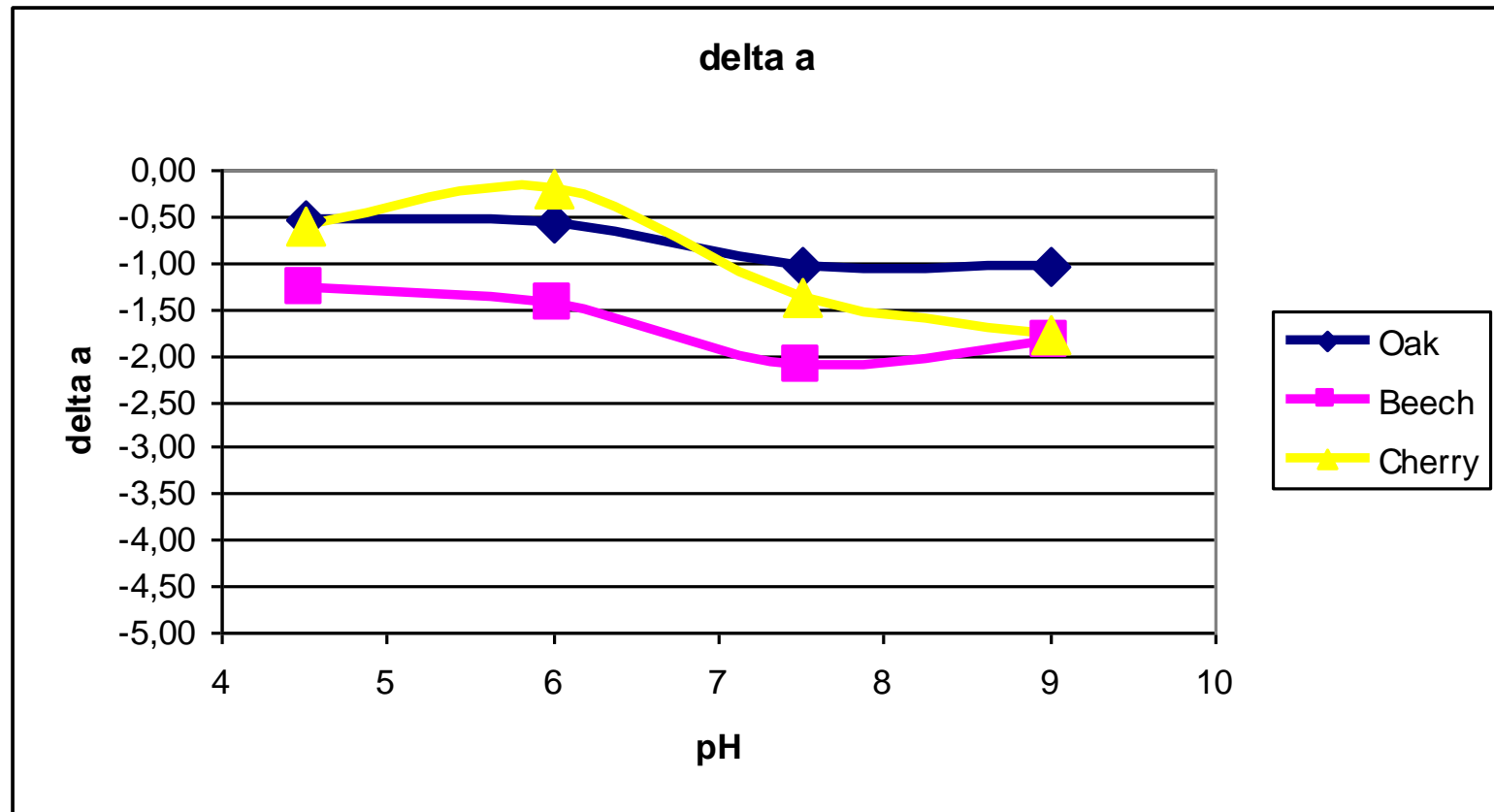
Change of pH colour measurement



Change of pH colour measurement



Change of pH colour measurement



Change of pH colour measurement

