



SIMULTANEOUS DETERMINATION OF PYRIDINE-TRIPHENYLBORON (TPBP) ANTI-FOULING AGENT AND ITS ESTIMATED DEGRADATION PRODUCTS BY CAPILLARY ZONE ELECTROPHORESIS

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1 BACKGROUND & PURPOSE

Pyridine-triphenylboron (TPBP) is used as the anti-fouling agent for ship hulls instead of organotin compounds

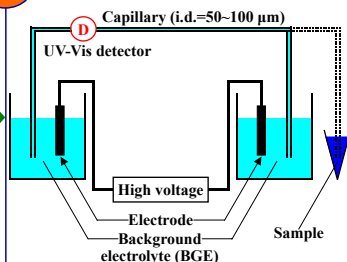
Degradation behavior of TPBP are not fully understood although there are a few papers^{1,2} concerning the degradation

It is shown that TPBP is decomposed to diphenylborinic acid (DPB), phenylboronic acid (MPB), and phenol etc., but the analytical procedure is not clear¹

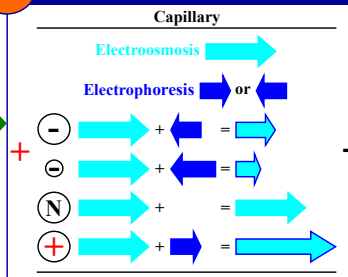
We have developed a capillary zone electrophoresis (CZE) method for determination of TPBP, DPB, MPB, and phenol

1) R.L. Amey, C. Waldron, *Proceedings of the International Symposium on Antifouling Paint and Marine Environment*, Tokyo, 2004, pp. 234-243.
2) X. Zhou, H. Okamura, S. Nagata, *Chemosphere* 67 (2007) 1904.

2 A SYSTEM FOR CZE



3 MIGRATION ORDER



10 CONCLUSIONS

- We have established a CZE procedure for determination of TPBP, DPB, MPB, and phenol to be useful for the examination of the degradation behavior of TPBP
- Limits of detection (LODs, S/N=3, μg/L) and values of the relative standard deviation (RSDs, %, 0.5 mg/L, n=6):
LODs=25-50; RSDs_{area}=3.4-4.7; RSDs_{height}=1.4-3.6
RSDs_{time}=0.73-1.1
- Linear calibration graphs ($r=0.9939-0.9989$) were obtained
- Further improvement of the LODs is desirable for lower concentrations of these compounds to make the method more useful
- It is hoped that a CZE method will be developed for determination of other estimated degradation products such as benzene, pyridine, and boric acid

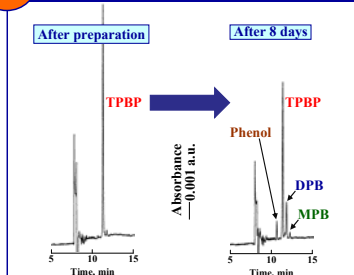
ADHERING OF ORGANISMS



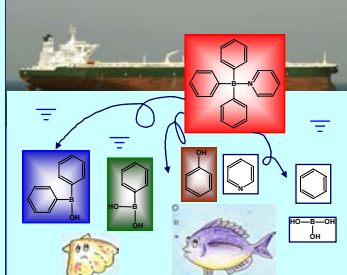
4 PROCEDURE

0.1 mol/L NaOH, 3 min
BGE (20 mmol/L sodium tetraborate, pH 10.0), 3 min
← Sample, 4 s (vacuum, 84 nL)
Voltage, 15 kV (sample inlet side as the anode)
Detection (direct, 200 nm)

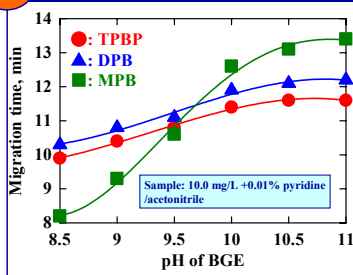
9 DEGRADATION OF TPBP



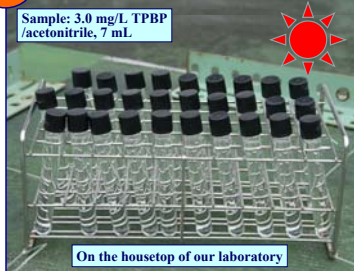
ANTI-FOULING AGENT



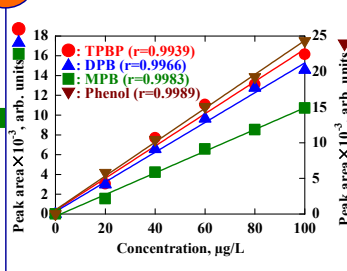
5 EFFECT OF pH OF BGE



8 SETTING OF SAMPLES



7 CALIBRATION GRAPHS



6 PRECISION & LODs

	RSD (%) ^a			LOD
	Area	Height	Time	(S/N=3)
				(μg/L)
TPBP	4.1	3.6	1.1	25
DPB	4.1	3.2	1.1	30
MPB	4.7	1.7	1.0	50
Phenol	3.4	1.4	0.73	29

^aSample: 0.5 mg/L, six determinations