THIN LAYER CHROMATOGRAPHY AS MODEL SYSTEM FOR INVESTIGATION OF THE MOBILITY OF METALS IN SEDIMENTS. I

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The chromatographic studies of the behaviour of some benzene derivatives related to humic acids in connection with Fe(III)-ion were published earlier (HADZIJA *et al.*, 1987; HADZIJA *et al.*, 1988; KVEDER *et al.*, 1992). The natural process of metal mobility in soil and sediments was simulated by using the model system composed of silica gel plates impregnated with aged iron nitrate (representing mineral iron hydroxy/oxide support) on which the model compounds representing the types of structures that probably occur in humic acids were chromatographed with water as developer.

By this simple experimental system we could follow the conduct of the compounds with various functional groups and deduce of their abilities to detach the Fe(III)-ion from the support to the solution. We also examined the behaviour of commercial humic acids under the same conditions and compared their behaviour with those of the model compounds (ISKRIC *et al.*, 1994). The results are given in the Table 1 where R_f values represent parameters of the solubility and mobility of the complexes formed by detaching of Fe(III)-ion from the support. Comparing the Rf's of the model compounds with those of humic acids one can see that humic acids moved considerably, as well as catechol and salicylic acid. Thus it can be concluded that humic acids tested have similar functional groups in their structures which can detach Fe(III)-ion from the support.

Table 1 : R_f x 100 values of hydroxy and carboxy benzene derivatives and humic acids on Fe(III)-impregnated silica gel plates. Developer: tap water

No	Compound	Structures	R_fx100	Ref
I	Catechol		78	3
II	Pyrogallol		0-71	3
III	Benzoic acid		16	3
IV	o-Phthalic acid		23	3
V	Salicylic acid		90	1
VI	Gallic acid		0-37	3
VII	3,4,5-Trimethoxy benzoic acid		6	1
IX	Humic acid "EGA"		0-88	4
X	Humic acid "Fluka"		0-88	4
XI	Humic acid "GMS"		0-60	4

REFERENCES

O. HADZIJA, S. ISKRIC and M. TONKOVIC, 1987. *J. Chromatogr.* 402 :358-360
O. HADZIJA, S. ISKRIC and M. TONKOVIC, 1988. *J. Chromatogr.* 460 : 220-222
S. ISKRIC O. HADZIJA and S. KVEDER, J. LIQ. 1994. *Chromatogr.* 17 : 1653
S. KVEDER, S. ISKRIC N. ZAMBELI and O. HADZIJA, J. LIQ. 1992. *Chromatogr.* 15 : 1719-1727

THIN LAYER CHROMATOGRAPHY AS MODEL SYSTEM FOR INVESTIGATION OF THE MOBILITY OF METALS IN SEDIMENTS. II

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In soil and sediments, organic and inorganic components are closely connected by forming salts and complexes and the consequence of these interactions is moving or sedimentation of metals. In the present work we examined, by the use of model experimental system, the behaviour of some toxic heavy metals (Pb(II), Cu(II), Cd(II), Zn(II)) in interaction with compounds, simulating the probable structure of humic acids.

The model system was chromatography of benzene derivatives of typical structures on thin layer of silica gel impregnated with metal salts and with tap water as the mobile phase. On the basis of the behaviour, i.e. R_f values, some conclusions about the solubility and consequently mobility of the complexes formed could be drawn.

All the model compounds except resorcinol show at the start position one spot, what may indicate their partial retardation effect. Resorcinol moved considerably indicating that the hydroxy groups improved the mobility of the metals. Other compounds tested beside the spot on the start position exhibit another spot having higher mobility. This was observed with benzoic and syringic acids on Pb(II), Cd(II) and Zn(II) impregnation and with o-phthalic acid and salicylic acid on Cu(II), Cd(II) and Zn(II) impregnation. One can conclude that with exception of resorcinol the model compounds formed with the support two kinds of complexes - one improving the mobility and the other retarding the metals.

Table 1. R_f x 100 values of hydroxy and carboxy benzene derivatives on Cu(II)-, Pb(II)-, Cd(II)- and Zn(II)-impregnated silica gel plates. Developer: tap water

		R_fx100							
Compound	Structure	Impregnant: Cu(II)		Pb(II)		Cd(II)		Zn(II)	
		R_{f_1}	R_{f_2}	R_{f_1}	R_{f_2}	R_{f_1}	R_{f_2}	R_{f_1}	R_{f_2}
Benzoic acid		11	-	7	70	0	67	0	77
o-Phthalic acid		7	50	18	-	10	55	9	58
Syringic acid		0	-	13	74	0	68	5	86
Salicylic acid		7	32	6	64	6	65	7	62
Resorcinol		-	49	-	69	-	77	-	74

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