

This article was downloaded by:

On: 25 January 2011

Access details: *Access Details: Free Access*

Publisher *Taylor & Francis*

Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



## Separation Science and Technology

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title~content=t713708471>

### Utilization of Steric Hindrance at the Metal Site in Separation of Copper(II) Chelates

F. Jursik<sup>a</sup>; M. S. Moez<sup>ab</sup>; B. Hájek<sup>a</sup>

<sup>a</sup> DEPARTMENT OF INORGANIC CHEMISTRY, PRAGUE INSTITUTE OF CHEMICAL

TECHNOLOGY, PRAGUE, CZECHOSLOVAKIA <sup>b</sup> Faculty of Education, Ain Shams University, Cairo, Egypt

**To cite this Article** Jursik, F. , Moez, M. S. and Hájek, B.(1974) 'Utilization of Steric Hindrance at the Metal Site in Separation of Copper(II) Chelates', *Separation Science and Technology*, 9: 6, 487 – 489

**To link to this Article:** DOI: 10.1080/00372367408055593

**URL:** <http://dx.doi.org/10.1080/00372367408055593>

### PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: <http://www.informaworld.com/terms-and-conditions-of-access.pdf>

This article may be used for research, teaching and private study purposes. Any substantial or systematic reproduction, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

**NOTE**

**Utilization of Steric Hindrance at the Metal Site in Separation of Copper(II) Chelates**

F. JURSIK, M. S. MOEZ,\* and B. HÁJEK

DEPARTMENT OF INORGANIC CHEMISTRY  
PRAGUE INSTITUTE OF CHEMICAL TECHNOLOGY  
16628 PRAGUE, CZECHOSLOVAKIA

**Abstract**

The chromatographic behavior of copper(II) chelates differing in the arrangement of their alkyl chains is influenced by the steric hindrance at the copper(II) site. This hindrance prevents the solvent molecules from coordinating on the remaining coordination positions, and thus  $R_F$  values of chelates decrease with increasing compression at the copper(II) site.

Much work has been devoted to the application of chromatography in coordination chemistry (for reviews, see Refs. 1 and 2). The most significant among these is the separation of geometrical and optical isomers. However, little attention has been paid to the study of factors which influence chromatographic behavior of metal complexes.

In this note we describe the separation of copper(II) chelates of isomeric ligands containing the same number of carbon atoms in the molecule but differing from each other in the arrangement of their alkyl chains. These include complexes of (*S*)- $\alpha$ -amino-*n*-caproic (nleu), (*S*)- $\alpha$ -aminoisocaproic (leu), and (2*S*, 3*S*)- $\alpha$ -amino- $\beta$ -methylvaleric (ileu) acids.

All these chelates, which were prepared by dissolving basic copper(II) carbonate in a hot solution of the proper ligand, have the same trans-

\*Permanent address: Faculty of Education, Ain Shams University, Cairo, Egypt.

planar geometry (3), corresponding to  $\text{Cu}(\text{N})_2(\text{O})_2$  chromophore as can be concluded from their electronic absorption spectra ( $\lambda_{\text{max}} = 620 \text{ nm}$ ). The chelates described are not soluble in common solvents, and their separation was possible only by using a solvent capable of coordination. Of a wide variety of the solvent systems tested, pyridine–water 93:7 gave the most satisfactory results, even though some tailing occurred in all cases. The use of acetic acid (one drop) in the developing solvent prevented formation of tails; however, it depressed separation.  $R_F$  values (Lucefol, ready-made cellulose plates, Kavalier, CSR. Distance of start line: 1 cm; detection by spray with  $\text{K}_4[\text{Fe}(\text{CN})_6]$  solution) were as follows:  $\text{Cu}(\text{nleu})_2 = 0.11$ ;  $\text{Cu}(\text{leu})_2 = 0.67$ ;  $\text{Cu}(\text{ileu})_2 = 0.83$ .

The chromatographic behavior of metal chelates depends both on the character of the central atom (4) and on the ligand. While the latter contributes to the total polarity of the molecule, the former can act as a Lewis acid. To decide which of these factors predominates, free ligands were chromatographed under the same conditions as described above. However, in all cases we observed  $R_F = 0$ . Thus we consider that  $R_F$  differences, as can be also demonstrated by the study of molecular models, are due to the steric hindrances imposed by the side alkyl chains of ligands which prevent, in different degrees, the solvent molecules from coordinating on the remaining coordination site of copper(II) (Fig. 1).

A study of the models shows that the degree of possible interactions decreases in the series:  $\text{nleu} \gg \text{leu} > \text{ileu}$ , which is the reverse order of the  $R_F$  values observed. Our assumption concerning the mechanism of separation can be supported by chromatography of these chelates in the 2, 6-dimethylpyridine–water 93:7 solvent system, in which all chelates studied showed  $R_F = 0$ . The presence of  $-\text{CH}_3$  groups in the 2 and 6 positions of the pyridine ring leads to several steric clashes, which make the coordination of this solvent practically impossible.

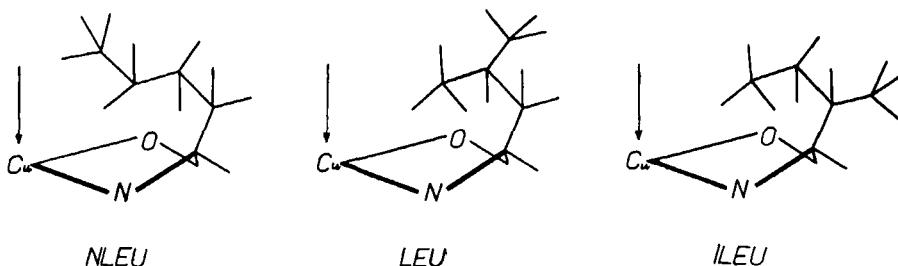


FIG. 1. Arrangement of side alkyl chains in copper(II) chelates.

## REFERENCES

1. V. Garunchio and G. G. Strazza, *Chromatogr. Rev.*, **8**, 260 (1966).
2. L. F. Druding and G. B. Kauffman, *Coord. Chem. Rev.*, **3**, 409 (1968).
3. R. D. Gillard and S. H. Laurie, *J. Chem. Soc., A*, 1970, 59.
4. F. Jursik, *J. Chromatogr.*, **19**, 448 (1965).

*Received by editor May 6, 1974*