

A THERMAL STUDY OF Cu(II) COMPOUNDS FORMED WITH PIPERAZINE DERIVATIVES

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Abstract

The thermal behaviour of some Cu(II) compounds formed with 1,4-disubstituted piperazine derivatives has been studied. The investigations were performed on a MOM 1500 derivatograph. The endothermic effects observed at 170–180°C are associated with the processes of dehydration and dehalogenation of the compounds, with general formula $LH_2 \cdot CuCl_4 \cdot H_2O$, where L is the piperazine derivative. The residue at 600°C remains relatively constant.

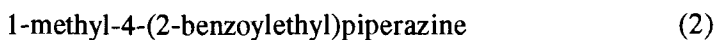
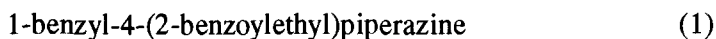
Keywords: complexes, Cu(II) compounds with piperazine derivatives

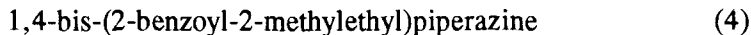
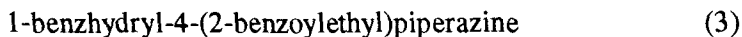
Introduction

During the past thirty years, the synthesis of metal complexes with organic ligands has been a popular field of experimental work, especially in view of the antitumor action that some platinum(II) complexes exhibit [1–4]. Besides the platinum complexes, compounds formed between other divalent metals and pyrimidine [5] or piperazine [4] derivatives are also of interest.

Because of the complicated structure of the organic moiety in such compounds, thermal analysis is being used increasingly frequently, along with other methods such as IR, NMR, etc., to study new metal complexes.

This work analyses the changes occurring during the thermal treatment of some Cu(II) compounds formed with 1,4-disubstituted piperazine derivatives, with the general formula $LH_2 \cdot CuCl_4 \cdot H_2O$ [6, 7], where L is one or other of the following organic compounds:





Experimental

The compounds were prepared by the interaction of CuCl_2 and the dihydrochlorides of 1,4-disubstituted piperazine derivatives ($L = 1-4$). The structures of the products were analysed by means of IR, EPR and X-ray diffraction methods.

The thermal investigations were performed on a MOM 1500 derivatograph. The sample quantity was in the range 50–90 mg.

The thermogravimetric curves were recorded under the following conditions: heating rate – 10 deg/min; atmosphere – air; final temperature 600°C; reference material Al_2O_3 .

Results and discussion

Figure 1 shows the DTA (1a and 3a) and TG curves (1b and 3b) of the Cu(II) compounds and L (1 and 3); and Fig. 2 the DTA (2a and 4a) and TG curves (2b and 4b) of the Cu(II) compounds and L (2 and 4).

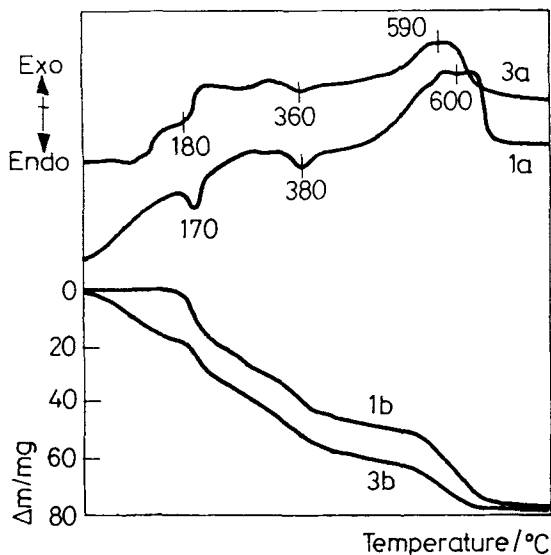


Fig. 1 DTA – (1a, 3a) and TG curves (1b, 3b) of Cu(II) compounds with 1-benzyl-4-(2-benzoylethyl) piperazine and with 1-benzhydryl-4-(2-benzoylethyl) piperazine respectively

Characteristic endothermic effects were observed at 170–180°C and at 340–380°C, respectively, followed by clear exothermic effects with maxima at 520–600°C.

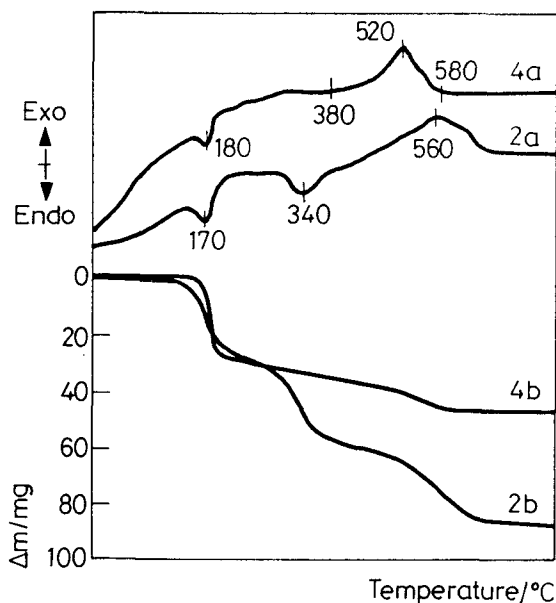


Fig. 2 DTA – (2a, 4a) and TG curves (2b, 4b) of Cu(II) compounds with 1-methyl-4-(2-benzoyl-ethyl) piperazine and with 1,4-bis-(2-benzoyl-2-methylethyl) piperazine respectively

Significant changes in the masses of the compounds began at 170–180°C, which almost coincided with the temperature intervals in which these compounds melt (160–200°C).

The thermal destruction at 170–180°C was associated with the liberation of about 31% of the molecular mass of the compound. The losses are attributed to processes of dehydration and dehalogenation.

Table 1 Quantities of volatiles at different temperatures

Final temperature / °C	Mass losses of the samples / %			
	1	2	3	4
200	27.5	31.1	42.5	56.0
300	42.5	51.1	57.5	68.0
400	60.0	66.6	75.0	72.0
500	72.0	75.5	80.0	80.0
600	92.5	95.5	97.5	94.0

Table 1 gives the results on the loss in mass after heating of the samples to different temperatures. The residue at 600°C remained relatively constant.

References

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Zusammenfassung — Es wurde das thermische Verhalten einiger Cu(II)-Verbindungen mit 1,4-disubstituierten Piperazinderivaten untersucht. Die Untersuchungen wurden mittels einem MOM 1500 Derivatographen durchgeführt. Die bei 170–180°C beobachteten endothermen Effekte stehen in Zusammenhang mit dem Dehydratations- und Dehalogenierungsprozeß der Verbindungen, deren allgemeine Formel $LH_2CuCl_4H_2O$ (L =Piperazinderivat) lautet. Der Rückstand bei 600°C bleibt relativ konstant.