Thermochimica Acta, 93 (1985) 121-124
Elsevier Science Publishers B.V., Amsterdam

THE EFFECT OF THERMAL TREATMENT ON THE PHASE TRANSFORMATION OF MEPROBAMATE

Margaret Dobrocsi and Ilona Konkoly Thege*, Institute of Inorganic and Analytical Chemistry, L.Eötvos University, Budapest, Hungary

ABSTRACT

DSC experiments gave unambiguous proof for the existence of all the three modifications of Meprobamate. Comparing our results with IR and RTG data in the literature, it may be assumed that the method under the applied experimental conditons /cyclic DSC combined with different cooling and heating rates/ gives convincing results.

INTRODUCTION

Literary data indicate that in the investigation of Meprobamate, the DSC method has been used only for determining the melting point and the melting enthalpy. It has been shown that slow cooling is favourable for the formation of the stable modification I and fast cooling for the development of modifications II and III /1,2,3/. The present paper confirms these results and describes conditions for the process of the development of individual crystal-modifications and transformations from one modification to an other.

MEASURING METHODS

Measurements were made with a Du Pont 990 Thermal Analyzer supplied with a DSC module. Additional experiments were carried out by means of a hot stage microscope with normal and polarization optics.

RESULTS AND DISCUSSION

Two types of Meprobamate sample were used: one consisted of modification I, the other of modification II.

The change of the heating rate did not alter the thermal behaviour of modification I. If the sample consisted of modification II only, at a fast heating rate /2o K/min/ one endothermic peak appeared which indicated the melting of the substance. If the heating rate was decreased /lo K/min/ modification II was formed in addition

---

Proceedings of ICTA 85, Bratislava

modification I /shoulder in Fig.1/. At 0,5 K/min heating rate the melting of modification I appeared like a separate endothermic peak. On the basis of these experiments the melting enthalpy of modification II can be determined only at a fast heating rate.

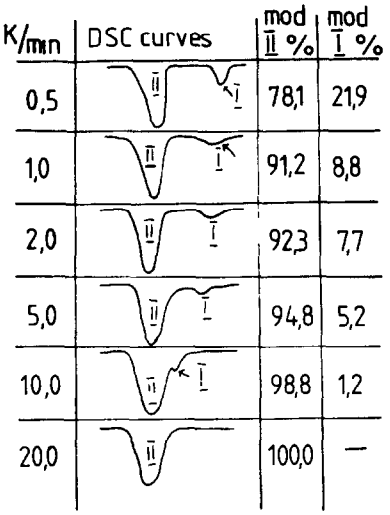

Fig. 1.Correlation between heating rate and II⟶I transition

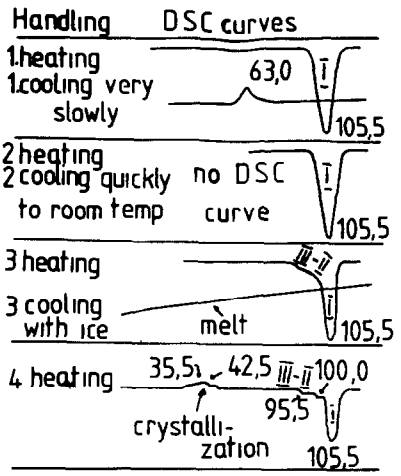

Fig.2. The effect of mode of cooling on the special development of Meprobamate crystals

As in the investigation of cooling processes always the melt of the salt was cooled, results for the different crystallized samples were the same /Fig.2/. When the fused Meprobamate was cooled very slowly in the instrument, after about 30 min, the melt always crystallized at 353-333 K- independently of the original modification of the sample - and at repeated heating the endothermic peak corresponded to the melting point of modification I. On fast cooling to room temperature the fused salt solidified only after 30 min and, as the melting points showed at the next heating, consisted mainly of modification I contaminated with modification II and/or modification III.

When the fused sample was cooled quickly with ice, the melt failed to solidify during the cooling process; as indicated on the thermogram by an exothermic peak between 293-313 K, solidification occurred only at the next heating. At further heating the character-

istic melting points of modifications III, II and I appeared.

On repeated cycles of cooling with ice and heating, transition III ⟶ II could be followed in the successive curves /Fig. 3/.

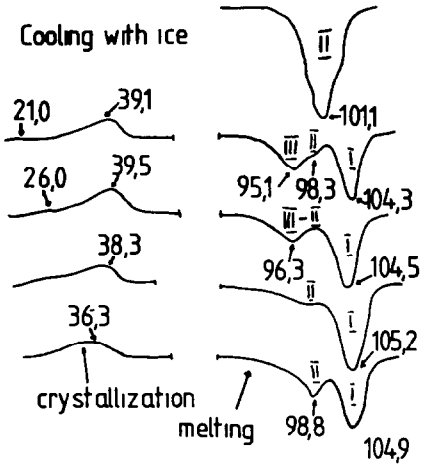

Fig.3. Transformation of unstable modification II at cyclic heating and cooling with ice

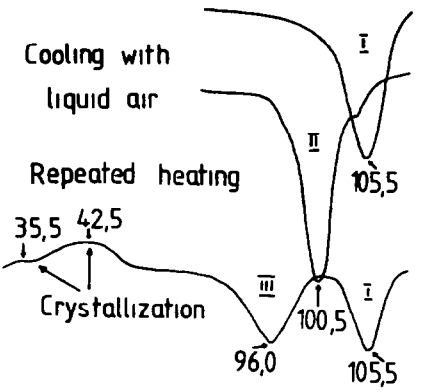

Fig.4. Proof of the existence of modification III of Meprobamate on the basis of DSC curves

When increasing the cooling rate with liquid air, the modification III was also formed and at heating appeared the appropriate melting peak for modification III, well separated from the melting endotherm of modification I /Fig. 4/. For comparison, the graph shows the melting endotherms of modification I and II, too.

CONCLUSIONS

It may be concluded that at slow heating rate the chance of transition II ⟶ I is greater than at fast heating rate. This is indicated by the fact that the area of melting endotherm for modification I was inversly proportional to the heating rate.

The DSC eperiments gave unambiguous proof for the existence of all the three modifications of Meprobamate. Comparing our results with IR and RTG data in the literature, it may be assumed that our DSC method and the applied experimental technique /cyclic DSC, combined with different cooling and heating rates/ gives convincing

results.

Our DSC curves obtained with cyclic heating have proved that modification III is unstable and transforms very readily to modification II. The existence of modification III have been proved by experiments in which the melt was cooled with liquid air and subsequently heated.

REFERENCES

1 J.A. Clements, S.D. Popli, Can. J. Pharm. Sci. 8 (1973) 88
2 A. Burger, K. Schulte, Arch. Pharm. 314 (1981) 398
3 A. Chauvet, S. Rubic, J. Masse, Thermochimica Acta 57 (1982) 173