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Note

THERMAL STUDIES OF HEAVY METAL STEARATES. i. CHROMIUM STEARATE–STEARIC ACID MIXTURES

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During attempts to identify the products resulting from the reaction between a chromium(III) salt and sodium stearate in aqueous solution, the thermal behaviour of mixtures of stearic acid and a chromium carboxylate was investigated. The results indicate the formation of complexes in these mixtures. The product from the reaction between chromic potassium sulphate and sodium stearate appears to be a mixture of stearic acid and OH-substituted chromium stearates, probably $CrSt_2OH$ and $CrSt(OH)_2$, with the former predominating (St = stearate) [1]. The acid can be removed from this mixture with ethanol. The DTG curves for this substituted stearate mixture to which known amounts of stearic acid have been added show that the stearic acid is released in two distinct stages.

EXPERIMENTAL

The preparation, extraction and analysis of the substituted chromium stearate have been described previously [1]. The stearic acid was BDH Specially Pure Grade. The thermal analysis was conducted on a Stanton Redcroft TG 750 thermobalance.

TABLE 1

Weight losses

100×Wt. ratio of acid: Cr stearate	100×Wt. ratio of wt. loss: Cr stearate			
	1. (188–275°C)	2. (275–360°C)	3. (360–483°C)	4. (483°C–end)
0	6.1	11.6	36.8	29.9
14.99	10.7	20.1	38.6	30.0
34.78	18.8	28.2	40.2	32.1
64.61	42.4	32.5	40.7	31.0
97.11	72.0	35.1	40.2	31.3
Pure acid	97.7	2.3		

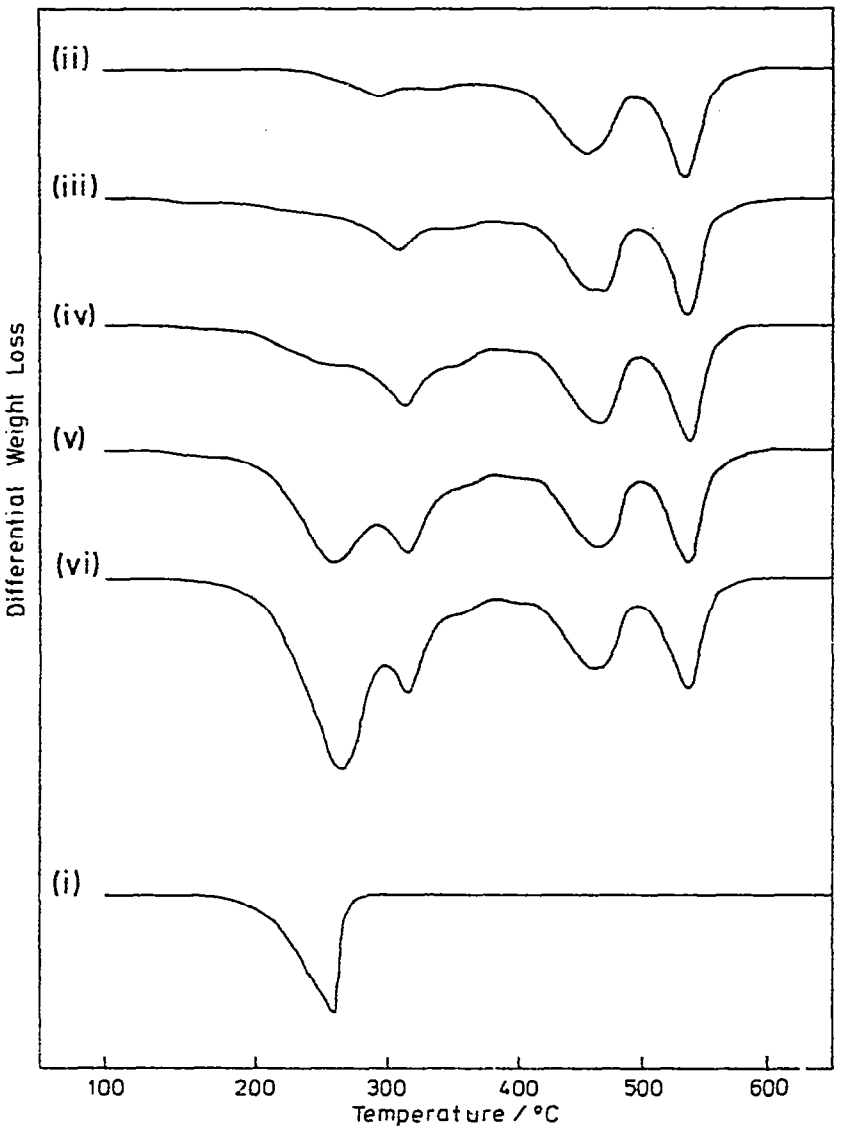

Fig. 1. DTG curves of stearic acid (i) and stearic acid/chromium stearate mixtures of weight ratios (×100) of 0(ii), 14.99 (iii), 34.78 (iv), 64.61 (v) and 97.11 (vi).

Samples (~ 2 mg), in Pt crucibles, were subjected to a heating rate of 20°C min^{-1}. A dynamic atmosphere of dried, white spot N_2, flow rate 25 cm^3 min^{-1}, was employed.

RESULTS

Chemical analysis

The chromium content of the reaction product after extraction with ethanol was 8.61%; the theoretical values for $CrSt_2OH$ and $CrSt(OH)_2$ are 8.18 and 14.08%, respectively.

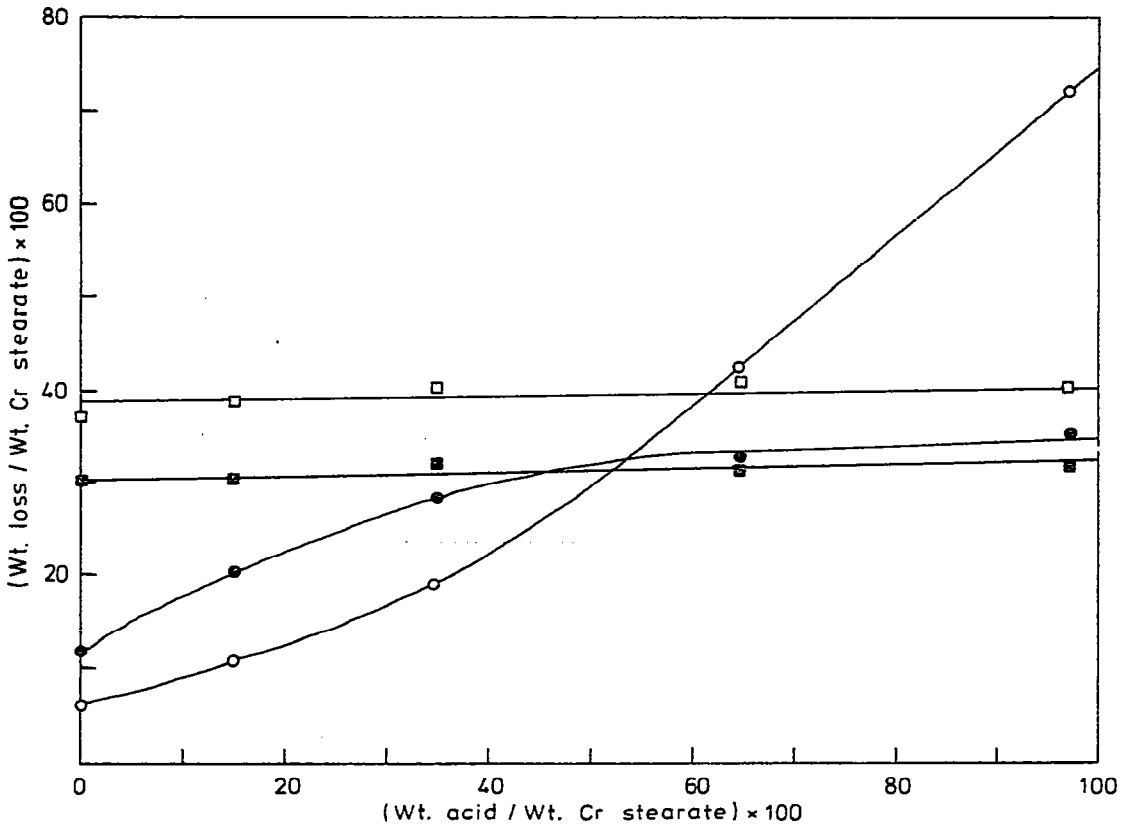

Fig. 2. Weight losses for four temperature ranges. ○, Peak 1 (188–275°C); ●, Peak 2 (275–360°C); □, Peak 3 (360–483°C), ■, Peak 4 (483–end).

Thermal analysis

The DTG curves for the mixtures of the extracted product and stearic acid are shown in Fig. 1. The weight losses, over four temperature ranges, for these mixtures are presented in Fig. 2 and Table 1.

CONCLUSIONS

As the amount of acid present in the mixture is increased, the weight losses associated with peaks 1 and 2 both increase. Peak 1, however, continues to increase over the whole range of added acid ratios but peak 2 tends to reach a maximum and constant value thereafter. (The slight increase in this ratio is due to the small overlap of peaks 1 and 2.) Peak 1 appears to correspond to the single peak associated with pure stearic acid evaporation. Peak 2, corresponding to the higher temperature range, appears to be associated with stearic acid whose evaporation is hindered by complex formation with the chromium compound. From the weight losses observed the molar ratio of complexed acid to chromium compound is in the region of 1:2. Similar behaviour has been observed with barium stearate [2].

REFERENCES

1 J.A. Wood and A.B. Seddon, Thermochim. Acta, 45 (1981) 365.
2 T. Flora and E. Vamos, Proc. 3rd Symp. Coord. Chem. 1970, Vol. 1, 1970, p. 517.