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THERMAL DIFFERENTIATION OF OILS USED AS COLLECTORS IN FLOTATION

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ABSTRACT

The samples of vegetable oils possibly serving as collectors in the flotation of magnezite ores were ivestigated. Some of them were not capable of the use in the flotation, some deliveries during the transportation showed no satisfying viscosity. The parameters limiting these properties were desirable. The samples differed neither in IR spectra nor in constants determined after standard testing for fats and oils, therefore other methods capable differentiate the samples were necessary. Thermal analysis, mainly a more rapid slope of TG curve helped to differentiate the samples according to different proportions of component with lower b.p. Thermogravimetric measurements checked us the propertienalisation of individual groups of components gained by the fractional distillation curve. On this basis and on further-by combination of GC and Mass Spectra gained data we proposed the criteria for the limitations of the undesirable components in oils for the use in flotation.

INTRODUCTION

The termogravimetric study of the oils and long chain fatty acids are not very often dealt in the literature /1/. It is caused by a great variety of components present in vegetable oils /2/ and their rather great instability at higher temperatures /cracking, oxidation, secondary reactions a.o./.
The testing of oils produced from different plant /3,2/ and animal fats is in general performed /3/ by the determination of constants /the acidic -, saponification -, iodine value a.o./.In this manner we can judge on the content of free and saponifiable fatty acids, esters, water, the unsaponifiable matter a.o.But it is possible to determine neither the quantities of individual present fatty acids, which are mostly responsible for the floatability of minerals /oleic, linoleic, linolenic acid/, when they are used as collectors, nor the amount of fatty acids influencing on the consistency of the collector, although there both kinds of acids are present in rather high proportions/ see Table 1/in oils.

MEASURING METHODS

Analysing two samples of collectors made from products of vege-

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table oils by standard testing we gained their constants /6/.
In the case of both collectors the constants were very similar, although the oils differed in consistencies at 25°C. The viscous collector was the sample T /Olein II/ and the liquid at 25°C - samle S /product of "dissociated fatty acids from raffination"/. The constants of both collectors were rather similar and after standard ČSN 580111 convenient, but the use of the viscous sample as collector in flotation was not easy.

Table 1. Individual fatty acids in some oils and fats /5/.

Fats or oils	Acid /%/						
	oleic	linoleic	linolenic	palmitic	stearic	erucic	myristic
Rapessed	26	18	2	2	2	50	-
Mustard	32	18	3	-	-	42	-
Flax	10	36	44	7	3	50	-
Sunflower	36	57	-	4	3	-	-
Soyabean	30	55	3	10	2	-	-
Tallow	44	3	-	23	20	-	3
Lard	48	6	-	28	12	-	1

We tryed to differentiate these samples /Fig.1/ by thermal analysis /Derivatograph MOM 102 OD Paulik-Erdey; 100 mg; T 600; DTA 1/3; DTG 1/5; TG 100; rate of heating: 3°/min./ for elimination of the non desirable components in further deliveries of oils from the producer /STZ Ústí n/Labem/. The oleic acid we used as collectors standard, the sunflower and soyabean oil for comparison.

RESULTS AND DISCUSSION

Oleic acid tested as standard showed weight loss 52,5% between 132 and 318°C /Max DTA 250°C/, its last broad exothermic process is finished at 485°C.
The samples S and T showed rather similar course of TG and DTG curves, but they diferred in the temperatures of their decomposition. The maximal weight loss /58%/ was in the sample S between 112 and 305°C /DTA max 262°C/. It is nearer in its thermal decomposition to the oleic acid.
The sample T lost 50,5% of its weight between 132 and 320°C /two DTA max; 286 and 304°C/ and the DTA curve of the sample exhibit rather higher complexicity. Mainly two exothermic processe are striking /451 and 471°C/, distinctly different from the last max.

of the-with properties convenient-collector S /442°C/.
The comparison of three samples together with soyabean and sunflower oil shows a rather stronger similarity of collector S to the oleic acid then collector T. Some differencies of sample T are in this behaviour from the liquid oleic, sunflower and soyabean oil. The curves of the last two are not very different from the oleic acid-till 350°C.
The results of the fractional distillation of the sample S and T at lowered pressure checked these facts, where the collector S convenient for the flotation exhibited a more stronger slope on TG /greater portion of components of low b.p./ as the solidifying sample T and in such manner TA helped us to specify the limitation of quantities of undesirable components in oils for this purpose. For further specification the same collectors were investigated by the combination of GC and MS measurements /6/. The results showed that the solidification of the sample T above 25°C is caused by rather higher content of the palmitic /16,46%/ and stearic acid /13,53%/, the amount of other fatty acids are rather similar. By this measurements we could definitely limitate the physical properties-important for the utilisation of oils as collectors, originated in definite amount of these two above mentioned acids /Max. 6-8% for palmitic acid and 2-4% for stearic acid/. This is possible to achieve by their removing with distillation or in winter by the selection of oils from convenient herbs for their use as collectors in flotation.

CONCLUSIONS

Thermal analyses measurements didnt help to precise the identification of components forming the collector, produced from vegetable oils, but from the course of the TG and DTA curves we may aestimate the convenience of oils to be as collectors in ore dressing plants, from the view of its components causing respectively the convenient or unfavourable consistency-still during its transportation.

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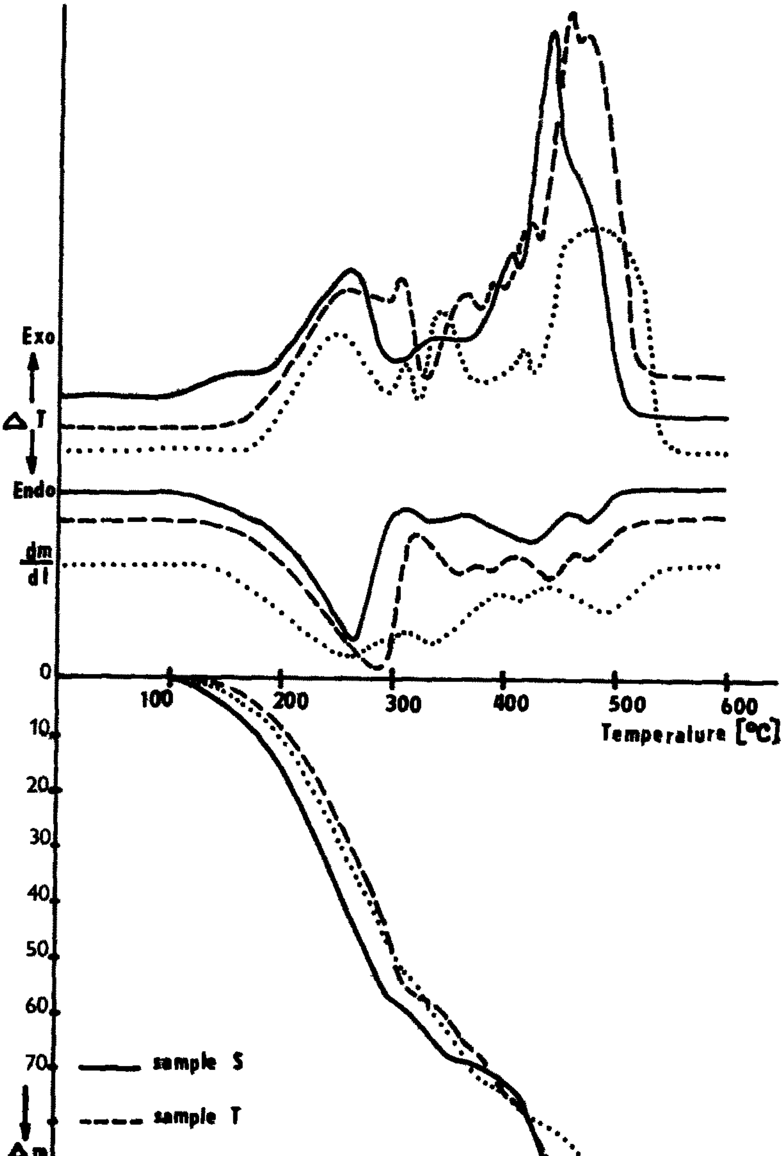

Figure 1: TG, DTG and DTA curves of tested oils.

The process of vibratory grinding of natural magne cality Miková, 42,33 % MgO, 3,20 % CaO, 2,88 % FeO, 0,9