The Binary System Palmityl Alcohol–Stearyl Alcohol

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IN THE LAST few years there has been substantial interest in long-chain alcohols, especially mixtures of C_{16} and C_{18} alcohols as materials to reduce evaporation from reservoirs (*2, 4*). The somewhat special virtues of these compounds presumably derive from their definite but limited surface activity or polarity and their favorable phase behavior. The phase behavior of the pure C_{16} and C_{18} alcohols has been described (*3*). An earlier publication on the binary system reports thermal behavior (*5*) and a recent article discusses x-ray diffraction behavior (*1*).

This article reports a combined thermal and x-ray diffraction study of the system with emphasis on $\alpha \rightleftarrows$ sub α reversible transformations.

Mixes with 0, 10, 25, 50, 75, 90, and 100% of C_{18} in C_{16} were observed by familiar capillary melting point, thermal curve, and x-ray diffraction techniques as used in the study of the components (*3*). In Figure 1 are shown melting points and transformation points (of $\alpha \rightleftarrows$ sub α) from both cooling and heating curves. In Table I are recorded diffraction data on 25, 50, and 75% mixtures above and below the transition points of sub α to α. Efforts to convert sub α forms to β at 27° C. were without success in 35 days, although the pure components are transformed completely in 30 days at 27° C. and in 1 day at 38° C.

The binary system $C_{16}OH$-$C_{18}OH$ behaves with great similarity to those of hydrocarbons (*6*) and ethyl esters (*5*), both reported by Smith; actually with greater similarity to these, in principle, than to the alcohol system as reported (*5*).

Table I. Diffraction Data for $C_{16}OH$-$C_{18}OH$ Mixtures

System	$C_{18}OH$, % 0	25	50	75	100
α Type pattern, (S.S., A., 4.17 V.S.) L.S., A.	44.3	46.0	48.3	49.4	49.0
Sample temp., ° C.	46	46	50	53	56
Sub α type pattern, 25° C., (S.S., A. 4.09 V.S. 3.73 M., 3.64 S.) L.S., A.	44.9	46.2	47.5	49.0	49.7

S.S. = short spacings; V.S. = very strong; S. = strong; M. = medium; L.S. = long spacings.

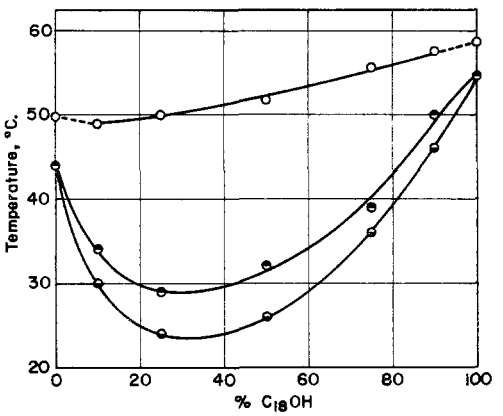

Figure 1. Thermal behavior of $C_{16}OH$-$C_{18}OH$ mixtures
O Capillary melting point
◒ Transformation sub α to α from heating curve
◒ Transformation α to sub α from cooling curve

These main features are observed:

Continuous solid solution formation for intermediate compositions, as evidenced by a single set of long spacings.

In contrast to the β forms at the component melting points, stable α forms at the melting points of intermediate compositions.

A notable dip at intermediate compositions in the level of $\alpha \rightleftarrows$ sub α transformation, so that the range of α existence for 50% $C_{18}OH$ is 20° in contrast to 5° C. for the components.

LITERATURE CITED

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