

For the cold form, the smaller angle at the centring chain in the plane perpendicular to c is calculated to be 71° . On transition to the hot form, within the accuracy of the few lines available, calculation indicates a dilatation of 4.5 per cent in the a -direction and a contraction of 3 per cent in the b -direction. This makes the above-mentioned angle decrease to 67° . The same tendency of the angle to approach 60° (hexagonal arrangement) has been observed by A. Müller³ on heating long-chain paraffins, and is explained by increasing rotation of the carbon chains about the c -axis. If we assume now that at the transition point this rotation begins to cover the full circle, it will eliminate in the hot form a considerable part of the dipole forces between the carboxyl groups of neighbouring parallel chains which, in the cold form, hold these groups in one plane. Thus, a parallel shift of the chains into disordered positions may be made possible.

As for the question why it is exactly that suberic acid shows this interesting type of transition, it is perhaps of interest that the high-temperature modification forms mixed crystals with adipic acid but not with sebacic acid, and that (001) is very weak in the former and strong in the latter. Perhaps the transition point, sharp or not, is situated below room temperature for adipic and above the melting point for sebacic acid, and observable only with suberic acid (only these two acids are comparable, as those with odd numbers of carbon atoms have double elementary cells, see ref. 2).

A flashlike transition has been described also by C. Weygand⁴ for "Tridekansäure"; however, we were unable to verify it, either with tridecylic (tridecanoic) or with myristic (tetradecanoic) acid.

GEORG-MARIA SCHWAB
MICHAEL DEFFNER

Departments of Inorganic and of
Organic Chemistry,
Nikolaos Kanellopoulos Institute,
Piræus.
Sept. 2.

¹ Schwab, G.-M., and Schwab-Agallidis, E., *Naturwiss.*, **29**, 134 (1941) see literature there.

² Caspari, I. W., *J. Chem. Soc.*, 3235 (1928).

³ Müller, A., *Naturwiss.*, **20**, 282 (1932).

⁴ Weygand, C., "Chemische Morphologie der Flüssigkeiten und Kristalle"; *Hand- u. Jahrbuch der chem. Physik*, **2**, III, C, 77 (Leipzig, 1941).

Molecular Interaction and its Relation to the Formation of Sodium Dodecylsulphate-Cetyltrimethylammonium Bromide Complex

It is well known that anionic and cationic detergents are not compatible in aqueous phase when they are present in equimolecular amounts. Compatibility is only observed for certain ratios which depend upon the molecular structure of both components. Precipitation of anionic by cationic detergents present in equimolar amounts constitutes the basis of one of the methods used for their estimation. The work carried out by Salton and Alexander¹ has shown this method to be applicable for determining small amounts of such pure detergents.

When the reagents are not well purified, the above method of titration is no longer valid, due to traces of polar compounds such as long-chain alcohols,

which are known to interact with the detergent to form a molecular association. Relatively high amounts of hexyl or heptyl alcohol are needed to prevent the precipitation, whereas the presence of octyl or nonyl alcohol in equimolecular ratio will inhibit the formation of sodium dodecylsulphate-cetyltrimethylammonium bromide complex. For example, an $M/300$ solution of these substances with octyl alcohol will be completely clear when these reagents are in the molecular ratio 1:1:1; in the absence of the alcohol a marked flocculation of the sodium dodecylsulphate-cetyltrimethylammonium bromide complex is observed. It is clear that the alcohol-sodium dodecylsulphate complex is competing with the sodium dodecylsulphate-cetyltrimethylammonium bromide association, and that as a result of the presence of the long-chain alcohols (C_8 , C_9) the anionic detergent has lost certain of its properties. Schulman² has already shown that cholesterol will inhibit precipitation of sodium cetylsulphate by addition of silver nitrate. The results now obtained show that with octyl alcohol a strong molecular interaction occurs and demonstrate the existence of a 1:1 complex of sodium dodecylsulphate-octyl alcohol, a conclusion already reached by Matalon³.

The inhibition of precipitation of anionic by cationic detergents appears then to be due to competition between two types of molecular interaction.

R. MATALON
M. R. J. SALTON
M. COHEN

Department of Colloid Science,
Free School Lane,
Cambridge.
Oct. 12.

¹ Salton, M. R. J., and Alexander, A. E., *Research*, **2**, 247 (1949).

² Schulman, J. H., *Trans. Farad. Soc.*, **33**, 1116 (1937).

³ Matalon, R. (unpublished work).

Exchange of Carbon-13 Dioxide between Solid Carbonates and Gaseous Carbon Dioxide

IN connexion with a study of the reaction mechanism of the thermal decomposition of dolomite, we are investigating exchange between carbon-13 dioxide ($^{13}\text{CO}_2$) and solid carbonates at high temperatures. To our knowledge exchange reactions using isotopic tracers between gaseous and solid reactants have, so far, only been carried out^{1,2} on oxides and oxygen-18.

Depending on temperature and partial pressure of carbon dioxide, dolomite can be decomposed either partially to $\text{MgO} + \text{CaCO}_3$ or completely to $\text{MgO} + \text{CaO}$. (Experiments on the isobaric thermal decomposition of dolomite at various pressures of carbon dioxide have been carried out simultaneously and will be published elsewhere.) In order to obtain further information on the reaction mechanism involved, a detailed investigation, particularly on the first stage of decomposition, was thought appropriate. In this case two questions immediately arise: (a) Is calcium carbonate primarily formed from the original dolomite lattice?— $\text{CaMg}(\text{CO}_3)_2 \rightarrow \text{MgO} + \text{CaCO}_3 + \text{CO}_2$. (b) Is dolomite first decomposed to magnesium and calcium oxides, when, under sufficient partial pressure of carbon dioxide, the latter then recombines to form calcium carbonate?—(i) $\text{CaMg}(\text{CO}_3)_2 \rightarrow \text{MgO} + \text{CO}_2 + \text{CaO} + \text{CO}_2$. (ii) $\text{CaO} + \text{CO}_2 \rightarrow \text{CaCO}_3$.