nature of mono- and diglycerides which may exist on the way. It is not clear to me why this is objectionable or how Kartha's calculation is any different in this respect. For example, random distribution equations describe the final state of a glyceride mixture equally well whether it was made by reacting a fatty acid mixture with glycerol or by a very specific synthesis of triglycerides which were randomized with a suitable catalyst as a last step.

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[Received July 24, 1962—Accepted March 11, 1963]

Definition of the Word "Detergent"

THE WORD "DETERGENCY" is commonly understood to mean cleansing or removal of soil (or dirt or foreign matter) from a substrate by a liquid medium. Definitions incorporating this concept are so frequent that there seems to be no confusion about the meaning of the word "detergency".

The word "detergent," in contrast, has different meanings for different people. Despite the great amount written about detergents, there have been few attempts at definition. These inconsistencies are well illustrated by the following definitions of "detergent."

Webster's Distionary (1) "A cleansing agent . . ."

Chemist's Dictionary (2) "(1) A substance used for its cleansing action. (2) A particular type of cleansing agent that does not precipitate insoluble sludge. Such detergents often contain organic sulfonates."

Tarring (3) "Broadly, a detergent is any material which, when added to water, assists in the removal and disposal of dirt from substrates."

Schwartz and Perry (4), p. 12, "The newer synthetic surface active agents are most often referred to, for brevity's sake, as detergents and/or wetting agents."

P. 369, "Detergency in its broadest sense merely means cleansing, and a detergent is therefore any agent which cleans."

Bacon and Smith (5) "A substance which when dissolved in water increases the inherent detergent power of water."

American Society for Testing Materials (6) "A composition that removes soil."

McBain (7), p. 100, "The American Society for Testing Materials defines a detergent as 'any material which cleans'. Thus, water through solvent and especially mechanical action, is an important detergent."

P. 103, "The three main classes of detergents are anion active, cation active and non-electrolytic."

Snell (8) "All detergents are surface active agents, the molecules of which concentrate and orient at the interface of a solution."

Durham (9) "Although detergency is a mosaic of many diverse phenomena a unifying element exists in the structure of the detergent ion or molecule. In all cases the detergent molecule has a dual character, in that a part of the molecule has water attracting tendencies, while at the same time the molecule also possesses groups that are hydrophobic. It is because of this peculiar molecular structure that detergent solutions possess good wetting and emulsifying power, that they foam and are capable of cleaning soiled surfaces."

It is apparent that one school of thought limits the use of the word "detergent" to long-chain dipolar compounds although many of these exhibit no power of detergency. Such compounds (amphiphiles) are adequately described by the term "surface-active agent" or similar expressions. It seems preferable that the word "detergent" be restricted to a meaning consistent with that of the unambiguous word "detergency".

Bourne and Jennings (10) consider that the common factor in all detergency is a work requirement. The principal function of a detergent is to reduce the work requirement (detergents are used because they make cleaning easier). Using this concept we propose the following definition:

A DETERGENT IS ANY SUBSTANCE THAT, EITHER ALONE OR IN A MIXTURE, REDUCES THE WORK REQUIREMENT OF A CLEANING PROCESS.

The definition is consistent with the meaning of the word "detergency". It does not specify any special chemical group of compounds. It includes soap. It includes the surface-active compounds that have some power of detergency, and excludes those that do not. It includes substances (such as sodium hydroxide) that have a strong power of detergency but are not surface-active; substances (such as the polyphosphates) that may have a synergistic effect; and substances (such as sodium carboxymethylcellulose) that restrict redeposition of removed soil. It is broad enough to include detergents that are used in non-aqueous systems. It includes solvents and also cleaners that function by chemical degradation (such as strong acids), since these reduce the work requirement to zero. It does not include abrasives, which do not reduce work requirement but merely increase efficiency with which the work is applied to the soil.

A well found definition of "detergent" should help resolve the confusion that arises when different workers use the same word to mean different things.

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[Received November 1, 1962—Accepted February 5, 1963]