Two Types of Antifoamers and their Cooperating Action

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The present authors pointed out[1] that attention should he drawn to two factors, foam stability and foam producing power, to explain the phenomena of foam formation, and also that two factors should be taken into account, i. e., foam breaking action and foam inhibiting action, to elucidate the phenomena of antifoaming. In this relation we have already shown[2] that when an aqueous solution of saponin which is marked for its foam stabilizing action is mixed with an aqueous solution of alcohol which is marked for its foam producing power, a pronounced foam formation, presumably due to their cooperative or syergistic action, can be observed even in such a dilute solution as they can exhibit only

1) T. Sasaki and S. Okazaki, *Kolloid-Z.*, **159**, 11 (1958).
2) T. Sasaki, This Bulletin., **15**, 449 (1940).

TABLE I. ACTION OF ANTIFOAMERS TOWARDS AQUEOUS SAPONIN AND SODIUM DODECYL SULFATE FOAMS

Saponin Foam (0.5% aqueous solution)

Antifoamers	Foam height in cm. Before addition	10 sec. after addition	3 sec. after shaken again
Silicone	10	9.4	0
i-Amyl alcohol	10	1.7	10
i-Amyl alcohol +silicone*	10	2.2	0
Ethyl acetate	10	5.5	10.6
Ethyl acetate +silicone*	10	5.6	0
Ethanol	10	7.3	11
Ethanol +silicone*	10	6.8	0

Sodium dodecyl sulfate foam (10^{-2} mol./l. aqueous solution)

Antifoamers	Foam height in cm. Before addition	10 sec. after addition	3 sec. after shaken again
Silicone	12	7.0	0
i-Amyl alcohol	12	0.7	12
i-Amyl alcohol +silicone*	12	2.0	0.6
Ethyl acetate	12	4.3	12
Ethyl acetate +silicone*	12	3.3	0.3
Ethanol	12	8.7	12
Ethanol +silicone*	12	6.7	0.8

* Composition of mixtures being 1 : 1 in weight. Room temperature : 16°C

a poor foam formation when each of them exists separately.

Now we can demonstrate a similar experiment also in the case of antifoaming. As we have shown,[1] silicone oil antifoamer is a well-known excellent foam inhibitor but is not always a good foam breaker, while *i*-amyl alcohol is a strong foam breaker but is not a good foam inhibitor* when added in a small amount. Now, when these two antifoamers of rather mutually opposite in the types of their actions are mixed together and a drop of the mixture is appleid onto the aqueous saponin and sodium dodecyl sulfate foams, a remarkable foam breaking action and foam inhibiting action are observed simultaneously. The results of these experiments are shown in Table 1. Similar instances may be shown for other pairs of antifoamers of the same relation. In this table we can also confirm a slight difference in antifoaming action of a given antifoamer towards different types of foams, i. e., saponin and sodium dodecyl sulfate foams. Anyhow, we can confirm distinctly the existence of two different types of antifoaming actions, i. e., foam breaking and foam inhibiting ones which have been reported merely qualitatively in many literatures,[3] and also confirm their cooperating action, though actually we can only make a rough distinction between two types of antifoamers according to these actions.

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* Detailed behavior of antifoamers will be reported elsewhere.

3) For instance, S. Ross and J. W. McBain, *Ind. Eng. Chem.*, **36**, 570 (1944).