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SOVIET STUDY ON FORMATION AND PREVENTION OF FOGS

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The formation of a fog consists of two stages: (1) formation of a supersaturated vapor, (2) generation and growth of centers of condensation in this vapor. Until recently, most investigators paid particular attention to the second stage and neglected the first. In the course of work done within recent years, A. G. Amelin, Doctor of Technical Sciences, subjected the first stage to a thorough study. On the basis of an original theory which he advanced, Amelin proposed a number of technical methods for predicting the formation of fog, inducing its formation, and preventing the formation of fog in various industrial processes.

Amelin's theoretical assumptions are based on a consideration of the following relationships. Condensation of a vapor sets in only at a definite degree of supersaturation, i.e., at the so-called critical supersaturation. In order that condensation of the vapor under formation of fog may take place, the actual supersaturation must be higher than the critical. The temperature of the gas mixture has a decisive influence on supersaturation. When the temperature rises, supersaturation first increases up to a certain maximum value and then drops. If the maximum degree of vapor supersaturation reaches a certain critical value, fog formation takes place.

A supersaturated vapor may form in several ways: on expansion of a gas mixture containing the vapor of a liquid; as a result of the cooling of such a mixture /without expansion/; on mixing gases which contain vapor of various temperatures; as a result of a reaction between gaseous substances leading to the formation of a compound which has a lower vapor pressure than the initial substances; and as a result of the condensation of a vapor on the surface of a solid or liquid body.

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Taking into consideration all of the cases enumerated above, Amelin developed a series of simple formulas which permit one to evaluate the conditions under which supersaturated vapor is formed. On the basis of these formulas, one can not only predict the possibility of fog formation, but can determine the concentration of the fog, once it has formed, and take measures for its prevention. The theoretical generalizations and calculation formulas of this investigator were confirmed by laboratory experiments (and, in part, experiments on an industrial scale) carried out with vapors of water, ethyl alcohol, sulfuric acid, mineral oil, and other substances.

Amelin's results have many practical applications. They can be used in preventing the formation of fog in tube condensers, during the concentration of sulfuric acid, at installations where volatile solvents are recovered by condensation, in the drying of gases with sulfuric acid, wherever a vapor is eliminated by freezing it out, etc. In Amelin's work, only definite, specific cases of fog formation have been discussed. However, the theory developed by him permits transfer of the calculations in question to many other cases encountered in industrial practice.

Amelin's work, which is distinguished by its originality, clarity, and simplicity, has laid the basis for a whole series of investigations which are of great scientific value and will find numerous applications in industry.

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