SOVIET MEN OF SCIENCE

PETR ALEKSANDROVICH REBINDER

(On the 70-th Anniversary of His Birth)

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On 5 October 1968 the outstanding Soviet scientist Academician Petr Aleksandrovich Rebinder celebrated his 70-th birthday and 45 years of scientific and teaching activity.

His scientific work has greatly assisted the development of modern colloid chemistry—the physical chemistry of disperse systems and surface phenomena.

His pupils—26 Doctors of Science and 100 Candidates working in many research centers of the Soviet Union—worthily represent Rebinder's school, which has always been concerned with the solution of urgent problems in our country's economy.

The work of Rebinder and his colleagues led to the solution of the problem of control of the destruction of disperse systems and of their properties by the use of adsorptive surface layers at the phase boundaries in such systems. This led to the development and improvement in the USSR of several branches of industry connected with the flotation of minerals, the pulverization of solid materials, drilling, the formation and destruction of stable colloidal systems, and the use of surface-active substances for control of various technological processes, particularly for intensification of oil recovery.

In the postwar years the work of Rebinder and his school advanced even more rapidly. From research on the formation of new surfaces resulting from the deformation and destruction of solids, and on the development of disperse spatial structures, Rebinder created a new borderline field of science—the physicochemical mechanics of disperse structures and solids.

Physicochemical mechanics has now developed into an important branch of the science concerned with new high-strength durable materials with a prescribed disperse structure and the best methods of manufacturing and of processing them with a combination of physicochemical, mechanical, and thermal factors. This new science has found extensive application in various branches of industry. Active lubricants, which improve the working of metals and alloys, have led to an improvement in the quality of surfaces and have increased the durability of instruments in mechanical engineering and metallurgy. An improved cement-manufacturing process based on the use of surface-active plasticizers, and a new vibrational technology for several industrial processes, are only two of the diverse applications of the new science to industry.

Rebinder's work has assisted the development of modern rheology.

Present-day drying technique is based in his theory not only on thermophysics, but also on special sections of physical and colloidal chemistry, and on the science of the modes of binding of moisture with substances, a science which has been created largely by the work of Petr Aleksandrovich and his pupils.

The removal of liquid from colloidal capillary-porous materials involves destruction of the bond between the moisture and the material, which requires a certain amount of energy. Academician Rebinder compiled a classification table of the modes of binding of moisture with material. This classification is based on a comparison of the binding energies. This gave a powerful new impetus to research on the sorption and desorption of moist materials and led to the solution of several important problems of moistening of materials, and to research on the interaction of damp air with colloidal capillary-porous substances. These investigations form the foundation of one of the important sections of the science of heat and mass transfer—the statics of drying processes.

Drying theory has established a direct relationship between the rates of heat and mass transfer and the rate of heating of moist material during drying. The discussed relationship is expressed in terms of the generalized dimensionless variable $(c/r)d\bar{t}/d\bar{u}$, where c is the reduced specific heat of the moist material, r is the specific heat of evaporation of moisture, and $d\bar{t}/d\bar{u} = b$ is a quantity characterizing the increase in the mean temperature of the solid as its mean moisture content changes and is the temperature coefficient of drying.

The generalized variable bc/r is the main characteristic of the kinetics of the process and is numerically equal to the ratio of the amount of heat expended on heating of the material to the amount of heat expended on evaporation of moisture in an infinitesimally small period of time. The generalized number bc/r is called the Rebinder number (Rb).

The use of Rb has shown a direct relationship between the mean moisture content and the temperature of materials. This has led to a coordination of drying theory and practical engineering calculations.

The results of the diverse scientific activity of Petr Aleksandrovich are represented in 400 scientific papers and ten monographs.

Rebinder and his colleagues are jointly responsible for the discovery of new plasticization effects, spontaneous dispersion, and the induction of brittleness in metals due to reduction of the surface energy.

The fruitful scientific and teaching work of Rebinder has been coupled with great public activity in the "Znanie" society, the Mendeleev All-Union Chemical Society, the Moscow House of Scientists, and other organizations.

Rebinder is president of the Scientific Committee AS USSR on the physicochemical mechanics of surface phenomena and surface-active substances and of several other scientific committees. He is editor-in-chief of "Kollidnyi Zhurnal" and a member of the editorial board of several journals and encyclopedic publications.

Rebinder has been given the title of Hero of Soviet Labor for his great services in the development of science and in commemoration of his seventieth birthday.

Petr Aleksandrovich Rebinder combines the talent of an outstanding scientist of encyclopedic erudition with modesty and great personal charm, inexhaustible energy, and joie-de-vivre.

We congratulate Petr Aleksandrovich on this glorious occasion and on the high government award and wish him sound health and further important creative success.