APPARATUS FOR HIGH-PRESSURE RESEARCH

by

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Pressure is one of the most effective means of altering the properties of a substance. With it one can act not only on the atoms comprising the substance but on the distance between the atoms. While great, but attainable, pressures are required to alter the electron shell of the atoms, the distance between the atoms can always be changed by varying the pressure. From the kinetic point of view, a combination of pressure and temperature is the most effective means of attaining structural changes.

Recently, pressures up to 100,000 atm (100,000 kg/cm^2) have been employed not only in science laboratories, but in some advanced branches of industry. However, even in laboratory practice pressure is not drawn on as willingly as is temperature, because of the complexity of the compression apparatus required and because of the lack of industrial models. The purpose of the present article is to acquaint the reader with the methods of developing high-pressure apparatus.

Hydrostatic pressure is employed in investigations of compressed substances to exclude unequal pressure effects. Up to pressures of 15,000 to 20,000 atm, hydraulic or gas pressure generators and reactors, in which a substance is to be studied or transformed, are used. Appropriate generators, electric leads, seals, and power lines already exist for this pressure range.

Hydraulic pressures up to 1000 atm can be obtained with the NZhR pump, developed and produced by the Special Designs Office of the Institute of Petrochemical Synthesis of the Soviet Academy of Sciences. Standard equipment is not available for pressures greater than 1000 atm. Manual piston pumps may be employed to create hydraulic pressures up to 2000 atm in small chambers. Hydrostatic