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Basics of adsorption What is Adsorption?

The term adsorption is divided into gas phase and liquid phase adsorption. The eponymous difference lies in the aggregate state of the fluid phase. For aeration dryers, gas phase adsorption is of greater importance.

This form of adsorption is characterized by a gas or a gas mixture as the fluid phase. This gas or gas mixture contains the adsorbing atoms or molecules. This been with the control "Adsorptive" designation, see picture. The surface which adsorbs the adsorbent is the "adsorbent". This can be a liquid as well as a solid. For the dehumidification, a solid is used as the adsorbent. With the addition of the adsorptive to the adsorbent, it becomes an "adsorbate". Adsorbent and adsorption are summarized under the term "adsorbate".¹

Addition of adsorption to the adsorbent is referred to as adsorption. This process is reversible and is called desorption.²

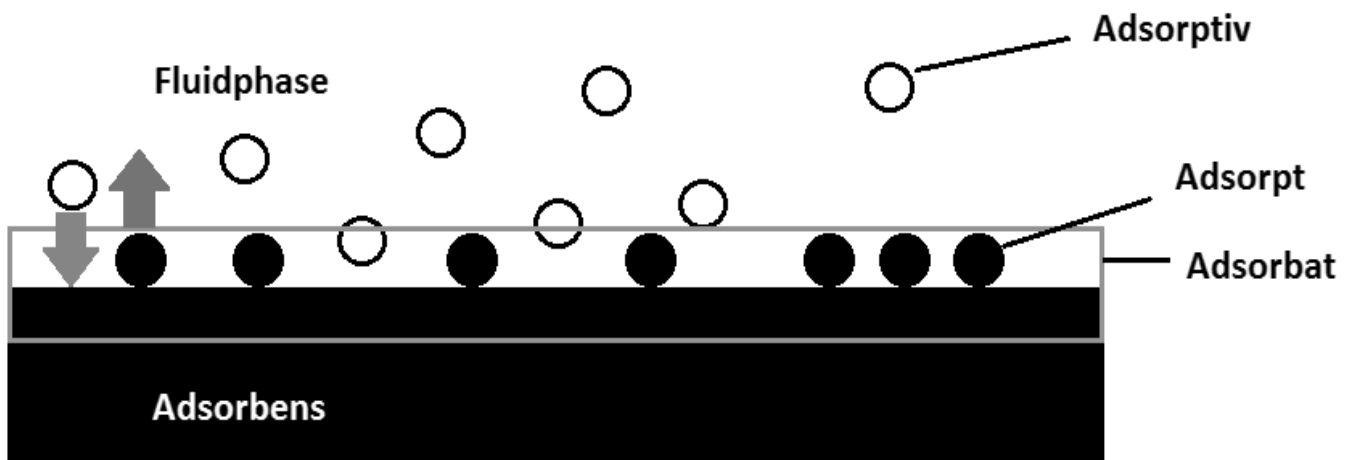


Illustration: Terms of adsorption.

The o.g. Chemisorption is based on covalent electron pair bonds between the adsorbent and the adsorbent. In the adsorption of water vapor physisorption is crucial. For these are physical interactions between the adsorbent and the adsorbent for this.

¹ Kast, Werner, 1981, Adsorption from the Gas Phase - Fundamentals and Techniques, Chem.-Ing.-Tech. 53, No. 3, pp. 160-172.

² Lohrengel, Burkhard (2007): Introduction to Thermal Separation, Oldenbourg Verlag München Wien. Lohrengel, Burkhard (2007): Introduction to Thermal Separation, Oldenbourg Verlag München Wien.



So-called hydrogen bonds³ are relevant for this adsorption of water molecules on technical adsorbents⁴ The van der Waals forces takes less of a share⁵ on.⁶

At a low relative humidity, the adsorption of water vapor takes place in monomolecular layers. As the partial pressure of water vapor increases, adsorption takes place in multimolecular layers, up to capillary condensation. The capillary condensation is a consequence of the vapor pressure lowering inside the adsorbent pores. The water vapor condenses and is present as a liquid in the pores.⁷

³ Hydrogen bonds are noncovalent interactions between dipole molecules.

⁴ Bathen, D. and Breitbach, M. (2001): Adsorption Technology, Springer-Verlag, Heidelberg.

⁵ Van der Waals forces are noncovalent interactions between the molecules.

⁶ Kast, Werner, 1981, Adsorption from the Gas Phase - Fundamentals and Techniques, Chem.-Ing.-Tech. 53, No. 3, pp. 160-172.

⁷ Kast, Werner, 1981, Adsorption from the Gas Phase - Fundamentals and Techniques, Chem.-Ing.-Tech. 53, No. 3, pp. 160-172.