Sol as an example of a colloid

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Sols are mixtures whose particles of substance dispersed in a liquid solvent are larger than particles present in proper solutions but smaller than particles in suspension. They are classified as **colloids,** i.e. mixtures with intermediate properties between real solutions and heterogeneous mixtures, which are suspensions. In colloids, the dissolved substance is a **dispersed phase**. The **dispersion medium** plays the role of solvent. Depending on the state of aggregation of the diffuse phase and the dispersion medium, several types of colloids are distinguished.

Dispersion center	Dispersed phase	Colloid name	Examples
Gas	gas	-	-
	liquid	aerosol	fog, clouds, spray varnish
	solid	aerosol	smoke, dust, soot in a flame
Liquid	gas	foam	whipped cream, shaving foam
	liquid	emulsion	milk, mayonnaise, ketchup
	solid	sol	metal oxides, hydroxides and salts with colloidal disintegration in water
Solid	gas	solid foam	pumice stone, insulating foam
	liquid	solid emulsion	milky quartz, ice cream, bituminous road surfaces
	solid	solid sol (solid dispersion)	ruby, amethyst

Colloids can be obtained by two methods.

The first is **condensation**, i.e. the joining of ions or molecules into larger bands. As a result, colloids of sparingly soluble oxides, hydroxides and salts as well as organic polymers are obtained.

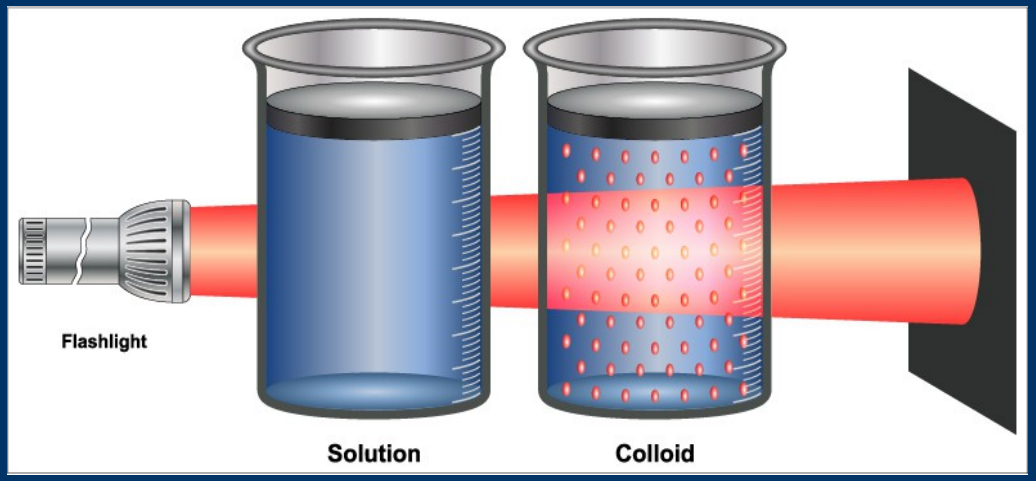
The second method is **dispersion**, which consists in grinding larger particles in a dispersion medium. This process occurs as a result of mechanical action, heat treatment or the use of ultrasonic waves. It is important to choose the right solvent to form the colloid with the substance. For example, soap forms water in the water and soap in gasoline.

Properties of sols

Some sols are very persistent. This property may be due to the electrostatic repulsion of dispersed phase particles endowed with identical charges due to the selective adsorption of one of the ions contained in the mixture. There is talk then of **lyophobic colloids**. There are also **lyophilic colloids** whose stability is the result of the formation on the surface of particles of the dispersed phase of the protective layer from particles of the dispersion medium. If the dispersion medium is water, the sols are classified as **hydrophobic** or **hydrophilic colloids**. Real solutions are more durable than colloids.

Tyndall effect

Sodium chloride forms a proper solution with water, and as a result of mixing the protein with water, a sol is formed. The observed cone is the result of light scattering on colloid particles. This phenomenon, called the **Tyndall effect**, is characteristic of sols and other colloids. The effect is very pronounced in lyophobic colloids, and weaker - in lyophilic. It can also be observed in smoky rooms. The Tyndall effect does not occur in solutions.



Coagulation and peptization

Under the influence of salts, the sols **coagulate** - the particles of the dispersed phase merge into larger clusters. Formed gelatinous, amorphous deposits called **gels**. Coagulation may also be caused by the addition of an electrolyte or alcohol other than a salt, increase in temperature, evaporation of the dispersion medium or shaking. It is a reversible process only for lyophilic colloids.

The gel can reform a sol, e.g. when water is added to it. This process is called **peptization**.

The irreversible process of protein coagulation is **denaturation**. It occurs under the influence of elevated temperature, acids, bases, heavy metal salts and ionizing radiation. As a result, the protein structure changes, which loses its functional properties.