

Emulsions from Proteins

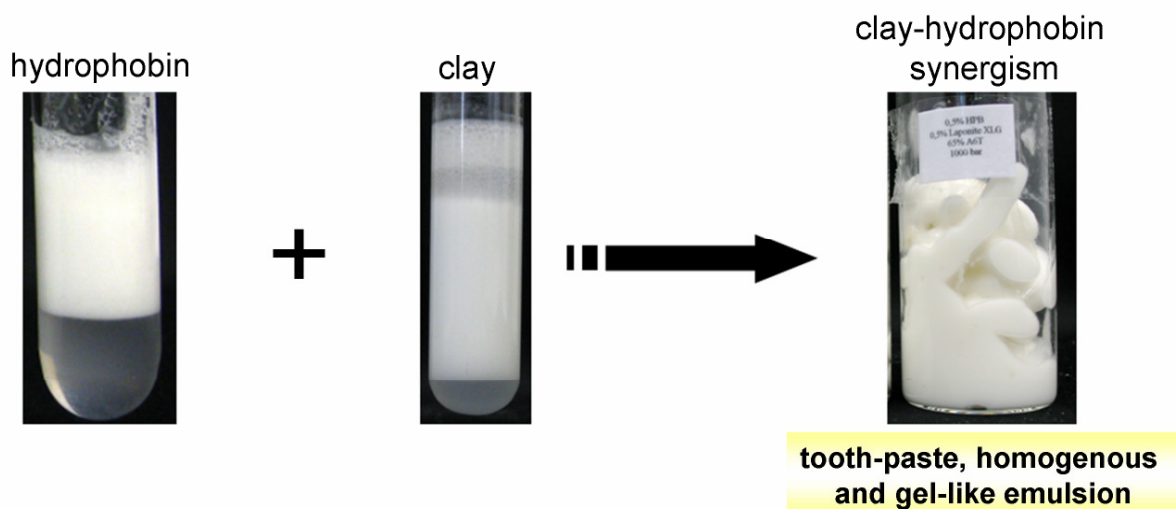
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Proteins are amphiphilic molecules. They are surface active and lower the surface tension of water, and the interface tension between hydrocarbons and water. Proteins stabilize foams and emulsions.

Several proteins were used for the preparation of emulsions, and the properties of the emulsions were studied [1]. The studies show that protein covered oil droplets behave very differently as surfactant covered oil droplets. Even in the case that the proteins are ionically charged, the droplets behave like sticky droplets. The adhesive energy between the droplets is obviously larger than the electrostatic repulsion energy between the droplets [2]. It is for this reason that the emulsions from proteins have gel-like properties with a rheological yield stress. The rheological properties from different proteins were determined and compared with each other. The investigations revealed that the storage module of hydrophobin emulsions was in the range of several hundred Pa. It was concluded that the high moduli were due to a three-dimensional network of the protein covered oil droplets.

Emulsions with an even stronger gel-like behaviour could be obtained when the proteins were first adsorbed to clay particles and the clay-protein particles were used for the preparation of the emulsions [3]. See attached figure which shows emulsions that were prepared from the protein hydrophobin, from clay alone and from hydrophobin covered clay particles.

Emulsions prepared from 0.5 wt% emulsifier and 65 wt% oil:



[1] Reger M., Sekine T. and Hoffmann H., *Soft Matter*, **2011**, 7, 8248-8257.

[2] Basheva E.S., Kralchevsky P.A. and A. Lips, *Langmuir*, **2011**, 27, 4481-4488.

[3] Reger M., Sekine T. and Hoffmann H., *Soft Matter*, **2011**, 7, 11021-11030.