

Laponite® sol forming grades

The ability to produce concentrated, low viscosity dispersions of Laponite® that “activate” when added to a range of different types of formulation has many advantages to the formulator. These low viscosity dispersions of Laponite® in water are called “sols”.

What is a sol?

The term “**colloid**” is applied to materials with particle size <500nm. With a particle diameter of 25nm, Laponite® fits this description.

The word “**gel**” is used to describe **high viscosity** dispersions of a colloid; the word “**sol**” is used to describe **low viscosity** dispersions of a colloid.

As a general recommendation, we advise customers who are formulating with Laponite® to avoid the preparation of a viscous pre-gel in water. If a strongly gelled Laponite® pre-mix is added into a liquid formulation, then the gel and liquid components can behave as if they are “out-of-phase” with each other and it may be difficult to get the Laponite® gel component dispersed homogeneously into the rest of the formulation. If this happens it will often lead to formation of gel seeds or grits in the system. Laponite® sol forming grades can be used to solve this problem.

Some types of dispersing agents can prevent, or delay, viscosity build with Laponite® by interfering with the mechanism of gel formation. They do this by peptising - *keeping separate*- the individual 25 nm diameter platelets of Laponite®. When the platelets cannot interact and bond with each other, Laponite® mixtures in water can easily be produced as low viscosity sols. When the sol dispersion is added into many different types of formulated products, the peptising effect of the dispersant is overcome and the combination will activate to give a gel structure.

Rockwood offers a range of Laponite® products that we describe as “sol forming grades”. These products are supplied ready modified with optimised levels of tetrasodium pyrophosphate or other, patented, additives. A brief summary of these grades is shown in the table below:

	Temporary sol grades	Permanent sol grades
Grade	Laponite® RDS & Laponite® XLS	Laponite® S482 & Laponite® SL25
Dispersant	tetrasodium pyrophosphate	patented additives
Typical sol stability (see note below)	6% solids ~3 months 10% solids ~1 week	15% solids >>1 year 25% solids >1 year

“Typical sol stability” refers to the length of time that the dispersion of Laponite® remains as a low viscosity liquid

As an alternative to using sol grades, it is also possible to temporarily “de-gel” Laponite® RD, or XLG, with polyols. For example, addition of low molecular mass polyethylene glycol (PEG), or polypropylene glycol (PPG) to a Laponite® RD dispersion in water will delay the formation of gel structure. Typically, a dispersion of Laponite® RD at 4% concentration in water will form a rigid gel that would be difficult to handle within minutes. Following the process described below will allow a low viscosity pre-mix to be made.

Using PEG or PPG to “de-gel” Laponite® RD

To 92 parts water (deionised, if possible) add 4 parts low molecular mass PEG or PPG, e.g. PEG 900. Set this mixing rapidly and add 4 parts of Laponite® RD powder continue mixing until dispersed.

The benefit of using this process is that this pre-mix is easier to incorporate into formulations such as automotive paints and wood coatings which often have very low levels of free water available to make the Laponite® pre-mix. It allows a low viscosity mixture of Laponite® to be stirred into a low viscosity resin system, where the de-gelling effect that the PEG or PPG has upon the Laponite® is overcome by other ingredients in the paint and viscosity increase will be seen within seconds. A further option is to use Laponite® LV. This grade shows reduced tendency to gel in deionised water and so allows easier combination into resin systems, but does not affect the rate or level of development of the final paint viscosity.

For more information- contact the Laponite team on help@laponite.com

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