

# SYLOID® FP Silica

Pharmaceutical Excipient

Application Note

## Syloid® FP Silicas for Oil Adsorption:

Syloid® FP silicas are mesoporous, amorphous, and micronized silica gels that are used as excipients in many pharmaceutical formulations, due to their unique morphology. The combined adsorption capacity, porosity, particle size, and large surface area allow them to provide several benefits simultaneously, which can expedite manufacturing and improve efficacy of the final dosage form.

Oils are used in pharmaceutical formulations to improve taste, prepare stable suspensions of drugs, add stability to APIs that are sensitive to hydrolysis, and in various other applications. In addition, oils are increasingly being used in formulations today as drug solubilizers, adsorption enhancers and vehicles for lipid based drug delivery, in order to increase the oral bioavailability of poorly soluble drugs. The main challenge in oil-based formulations is converting oily solutions and liquid formulations into compressible solid or semi-solid formulations.

Syloid® FP silicas are an excellent carrier for converting oils, oily drugs, and drugs in oil solutions into free flowing powders. They can be used as adsorbents in techniques such as solid dispersion, semi-solids and in lipid-based technologies such as self-emulsifying drug delivery systems (SEDDS).



### Adding Syloid® FP Silica Can Help In:

- Retaining aromas and tastes
- Preventing sticking to machinery
- Preparing stable suspensions
- Converting liquids to powders
- Solutions for lipophilic APIs
- Carrying oily drugs

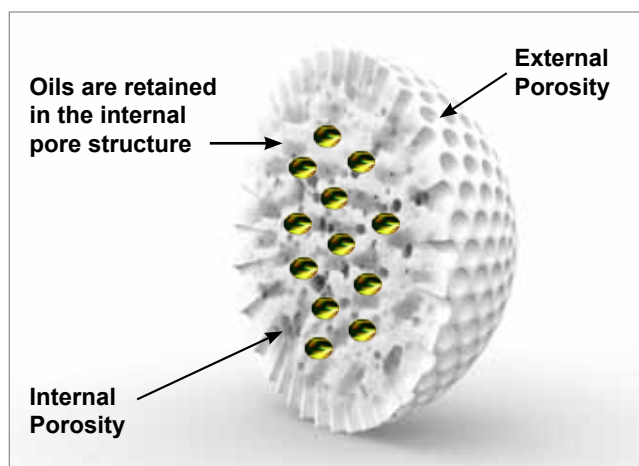
## Syloid® FP Silica Oil Adsorption Study:

Syloid® FP silicas have a high adsorptive capacity for several oils that are commonly used for solubilizing and loading APIs.

| Adsorption of Oils on Syloid® 244 FP and AL-1FP Silicas* |                            |                         |                                |                                |
|--|----------------------------|-------------------------|--------------------------------|--------------------------------|
| No.  | Oil Type                   | Specific gravity (g/mL) | Syloid® 244 FP Silica (g/100g) | Syloid® AL-1FP Silica (g/100g) |
| 1  | Raw linseed oil            | 0.93                    | 334                            | 93                             |
| 2  | Eucalyptus oil             | 0.915                   | 368                            | 91                             |
| 3  | Lemongrass oil             | 0.895                   | 327                            | 89                             |
| 4  | Peppermint oil             | 0.89                    | 347                            | 89                             |
| 5  | Castor oil                 | 0.96                    | 356                            | 100                            |
| 6  | Sesame oil                 | 0.923                   | 338                            | 99                             |
| 7  | Olive oil                  | 0.92                    | 345                            | 97                             |
| 8  | Oleic acid                 | 0.895                   | 340                            | 96                             |
| 9  | Clove oil                  | 1.045                   | 430                            | 106                            |
| 10   | dl- $\alpha$ -Tocopherol** | 0.95                    | 332                            | 93                             |
| 11   | Miglyol 812                | 0.94                    | 359                            | 92                             |
| 12   | Solutol HS 15              | 1.04                    | 360                            | 104                            |

\* Data shown for selected oils. Several other oils such as paraffin oil, mineral oil, lavender oil, etc. were also tested with similar adsorption capacity observed.

\*\*Adsorption capacity was tested after dl- $\alpha$ -Tocopherol was gently warmed to 50°C prior to mixing due to its high viscosity.



The combined internal and external porosity of Syloid® FP silica gives it greater available surface area and a higher adsorptive capacity for oils.

## Procedure:

In this experiment, Syloid® FP silicas were activated in an oven for 2 hours at 120°C. However, testing was also conducted without activation with no significant difference in results. Syloid® FP silica (2 grams) was placed in a beaker and the oil was added drop-wise using a micro-burette. The oil was mixed thoroughly with the sample using a metal spatula. The addition of oil was continued until a thick paste-like mass was formed. The addition of oil was stopped when the paste-like mass was obtained without any excess oil. The oil volume consumed was recorded and the adsorption capacity was determined.

**Note:** When mixing viscous liquids or oils, the viscosity can be reduced by slightly heating the oil or by adding alcohols that evaporate easily (e.g.: ethanol, methanol).

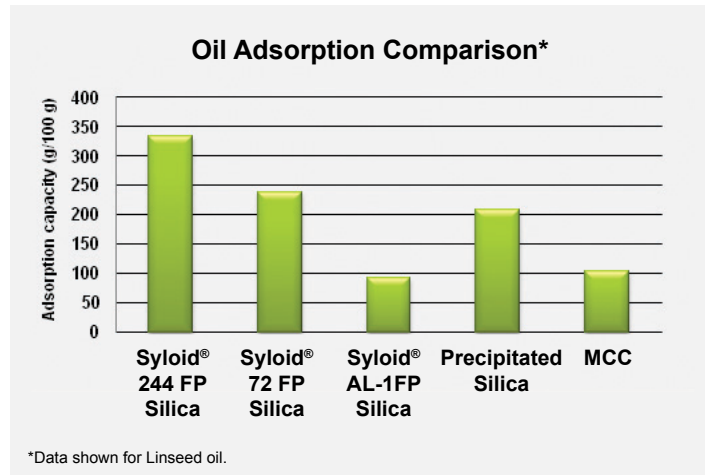
## Conclusions:

Syloid® FP silicas can be used for as carriers for adsorbing large amounts of oils, thus converting oils to powders while maintaining good flow properties.

When combined with binders, Syloid® FP silicas are an ideal choice to convert liquid formulations into compressible liquid-solid or semi-solid formulations.



**Figure 1.** Miglyol loaded on Syloid® 244 FP silica results in a free-flowing powder with oil adsorption of 1:2.5 (Syloid® 244 FP silica:Oil).



**Figure 2.** Syloid® 244 FP silica oil adsorption capacity compared to precipitated silica and MCC.

## Expect More From Your Excipient

By expecting more from your excipient and developing a collaborative relationship with the manufacturer, you can gain valuable insights on improving your formulations.

Excipients are emerging as strategic drug development tools in today's challenging pharmaceutical landscape. Partner with Grace to learn more about multi-functional excipients, gain confidence in product quality, and develop future drug delivery solutions.

Syloid® FP silicas are specifically cited in numerous patents due to their unique properties that improve the handling, adsorption, dissolution of many pharmaceuticals. Learn how Syloid® FP silicas can benefit your formulation.

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