

Waytop Microspheres

# Expandable Microspheres in Super Light Clay

T e c h n i c a l   G u i d e

[www.expandablemicrosphere.com](http://www.expandablemicrosphere.com)

# Subjects

- Benefits with Expandable Microspheres
- Basic formulation
- Suitable Expandable Microspheres grades
- Mixing equipment
- Cross-linking agents
- Binders
- Guidelines to modify formulations



# Benefits with Expandable Microspheres

Super Light Clay with expandable microspheres has the following unique properties:

- Good plasticity
- Easy to shape
- Good flexibility
- Non-stickiness
- Extrudable
- Low shrinkage upon drying
- Good storage stability
- Long usage time



# Basic Formulation

Super light clay with expandable microspheres commonly includes:

- 3 to 7 percent by weight of expandable microspheres (dry)
- 65 to 75 percent by weight of water
- 5 to 15 percent by weight of binders, mainly PVA or CMC
- 3 to 15 percent by weight of humidifier, glycerol etc.

To achieve certain properties you can add small amounts, typically 0 to 5 percent by weight, of the following additives:

- Cross-linking agent: boric acid etc
- Wetting agent
- Antifoaming agent
- Preservative
- Pigments
- Polyethylene oxide
- Vinyl acetate resin
- Waxes
- Water soluble gum
- Fragrance



# Starting Formulation

Below is a simple formulation.

Ingredients	Parts by weight
Water	71.0
Glycerol	4.0
Expanded Microspheres JH50D	5.0
Na <sub>2</sub> B <sub>2</sub> O <sub>4</sub> , 13 g/l sodium tetraborate solution	7.0
PVA 2488	13.0
Total	100

Generally, we recommend the following mixing procedure when using the dry expanded grades:

1. Dissolve the PVA 2488 according to the supplier recommendations.
2. Cool down the PVA glue to 60 to 70°C.
3. Add additives: glycerol, preservative, wax, pigments, etc.
4. Add dry expanded microspheres and mix well.
5. Add the cross-linking agent slowly and mix homogeneous.



# Suitable Expandable Microspheres Grades

In this technical guide, we have only mentioned one expandable microspheres grades but there are a number of other grades that will also work for clay applications. Contact us to learn more.

### Specifications

Grade	Average Particle Size (µm)	Softening Temp (°C)	Density kg/m <sup>3</sup>
WP20W/D	20-30	110±5	30-40
WP40W/D	30-50	100±5	20-30
WP80W/D	70-90	120±5	15-25
WP100W/D	90-110	85±5	13-18



# Mixing Equipment

Since the viscosity of the final modeling clay products is very high, we would recommend a slow type of mixing/kneading equipment, e.g. planetary or double arm mixer, kneader.



# Cross-linking Agent

The cross-linking agent will increase the viscosity of the PVA, reduce the stickiness and increase the elasticity of the super light clay.

There are a lot of other cross-linking agents which can be used to cross-link PVA, for example:

- Dialdehyde
- Water based polyamide epichlorohydrin resin
- Zirconium ammonium carbonate salt



# Binders

The PVA binder in the formulation can be replaced by other binders to achieve other properties,

- CMC improves the smoothness and ductility.
- Vinyl acetate improves flexibility after drying.
- Polyethylene oxide reduces the stickiness.



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# Thank You!

If you want to learn more, please contact us!

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