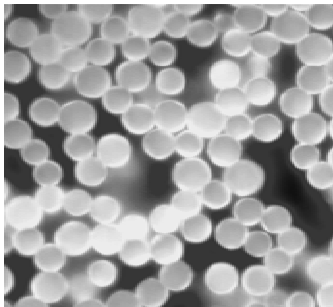


## Fluorescent Seeding Particles for PIV Applications



### Advantages:

- **Excellent brightness**
- **Large-volume industrial use**
- **Dry particles**
- **Excellent water dispersibility**
- **Excellent water stability**

### Features:

- **Moderate size dispersity**
- **Uniform spherical shape**
- **Minimal photobleaching**
- **Minimal dye leaking**
- **No swelling or shrinking**
- **Good mechanical stability**

### Benefits for:

- **Single-phase liquid flows** <sup>1</sup>
- **Multi-phase flows** <sup>2</sup>
- **Industrial large-scale flows** <sup>3</sup>
- **Near-wall flows**
- **Micro flows**
- **Stereo PIV** <sup>4</sup>

<sup>1</sup> The enhancement of image contrast is beneficial for most PIV applications, even for simple liquid flows, in order to improve the measurement accuracy.

<sup>2</sup> Bubbly flows and droplet flows etc.

<sup>3</sup> Mixing tank and filtering flows etc.

<sup>4</sup> The emission of fluorescence is independent on the viewing angle unlike the Mie scattering. The intensity difference often seen between cameras can be minimized, leading to enhance the accuracy of Stereo PIV.

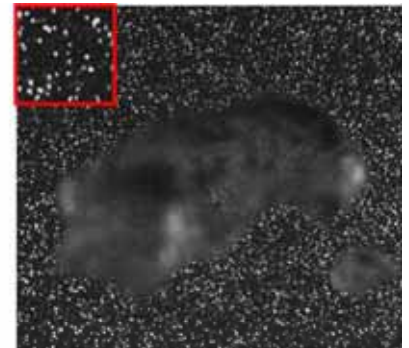
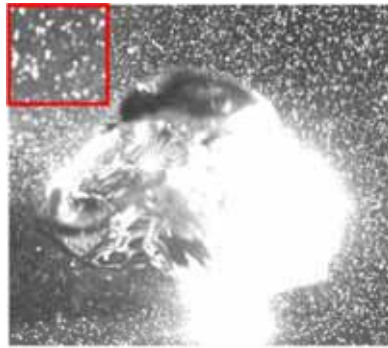
### FLUOSTAR Rhodamine B-encapsulating microspheres are seeding particles optimized for Particle Image Velocimetry

EBM's FLUOSTAR microspheres are polymer particles encapsulating the fluorescent dye, Rhodamine B, which emits the orange-colored fluorescence when illuminated by a green-colored laser (e.g. Nd:YAG, Nd:YLF).

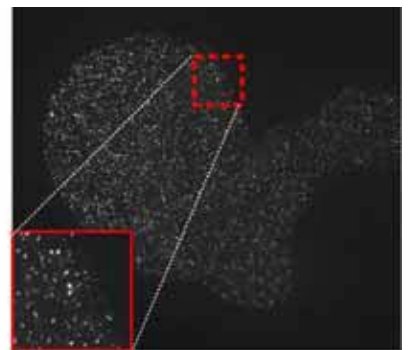
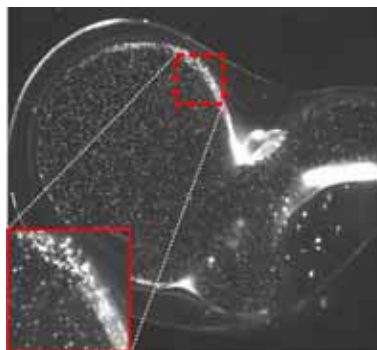
FLUOSTAR microspheres feature the outstanding emission efficiency of fluorescence, which are best suited for PIV applications. The strong orange-colored fluorescence can be even observed by sight using a **5 mW laser pointer** !!!

The orange-colored fluorescence can be selectively acquired by an imaging device equipped with a color filter available commercially. This fluorescent PIV technique can significantly suppress the optical noise originating from the reflection of the laser light, thus being able to enhance the signal-to-noise ratio for most PIV applications.

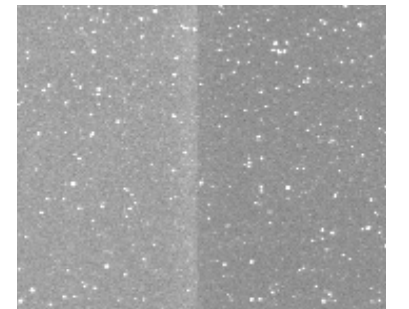
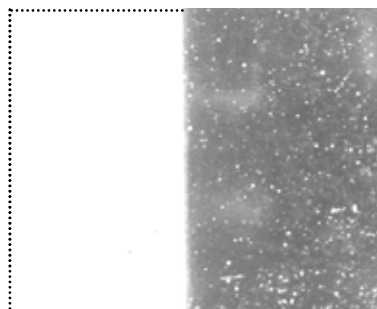
### 1. Application notes



#1 Bubbly flow (left: normal particles, right: FLUOSTAR)



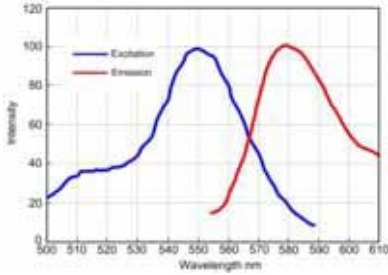
#2 Near-wall flow inside a silicone-made replica of a cerebral blood vessel (left: normal particles, right: FLUOSTAR)



#3 A large-field measurement with a white background (left: normal particles, right: FLUOSTAR)

All images above are original without applying image enhancement. Application #1 and #2 derived from Time-resolved PIV using Nd:YLF laser with an energy of 5 mJ/pulse and a standard high-speed CMOS camera, and Application #3 from standard PIV using Nd:YLF laser with an energy of 120 mJ/pulse and a standard CCD camera. Those sample images are available upon request.

## Optimal properties for PIV techniques



Fluorescent spectra of Rhodamine B dye

## Specifications

## Ordering information

## 2. Excellent brightness

Rhodamine B is a well-known fluorescent dye, but once compounded into seeding particles, the emission property of fluorescence is not widely understood because of a variety of compounds and formulas available. Based on a novel patented technique, the emission efficiency of fluorescence is dramatically enhanced, which is even maximized in the present configuration. The strong orange-colored fluorescence can be even observed by sight using a **5 mW laser pointer !!!**

The orange-colored fluorescence can be selectively acquired by simply placing a long-pass filter in front of the lens. Typically, the optical filter has a sharp cut-off wavelength of 550 nm.

## 3. Large-volume industrial use

Conventional fluorescent particles can not be routinely applied for a large-scale model, such as a mixing tank, in view of the cost and benefit. This is simply because they are not necessarily optimized for PIV applications not only from the emission efficiency of fluorescence, but also from the cost as a consumable product. The size distribution of FLUOSTAR microspheres is moderately controlled with the C.V.\* less than 20% to ensure the economical aspect of the particles.

\* C.V.: Coefficient of Variation, or the percentage of the standard deviation to the mean diameter.

Substrate material:	Carboxy-modified acrylate resin
Refractive index:	1.560 (polymer)
Temperature:	Resistant up to 100 (polymer)
Fluorescence dye:	Rhodamine B (Excitation 550 nm /Emission 580 nm)
Density:	1.1 g/cm <sup>3</sup>
Diameter:	15 $\mu$ m (Uniform spherical shape)
Size uniformity:	Less than 20% C.V.
Sizes:	1, 5, 10
Particle Life:	2 years
Package includes:	MSDS (Material Safety Data Sheet)
Storage:	Store at room temperature in a dry area. A bottle should be tightly sealed.
Handling:	Glove and respiratory protection are recommended.

\* FLUOSTAR is for research use only. Specifications may vary minimally due to minor variation between batches.

Part#	Density	Size	Quantity
F1015-01	1.1 g/cm <sup>3</sup>	15 $\mu$ m	1 g
F1015-05	1.1 g/cm <sup>3</sup>	15 $\mu$ m	5 g
F1015-10	1.1 g/cm <sup>3</sup>	15 $\mu$ m	10 g

The density and size of particles available are currently limited to the above (June, 2008), and soon further variations will be released. Currently, the customized particles are only available upon request with additional costs.

**LIMITED WARRANTY:** This product line is for laboratory use by trained scientists and engineers. EBM Corp. is not responsible for determining the suitability of the end use. All liability arising out of the use of this product is assumed for end users.

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