

CARGILLE LABORATORIES

IMMERSION OILS



FOR THE SHARPEST IMAGE POSSIBLE



CARGILLE IMMERSION OILS

Research Quality Is Our Standard

Check Cargille's Record

Since 1924, Cargille Laboratories has been providing specialized services to a broad range of laboratory sciences. Advances for the microscopy field continually develop from Cargille Laboratories' extensive research, among them many significant achievements:

- First NON-DRYING immersion oil 1940
- First HIGH-VISCOSITY immersion oil 1950
- First PCB-FREE immersion oils 1971
- First ULTRA LOW-FLUORESCENCE immersion oil 1984
- First Ultra Low-Fluorescence HALOGEN-FREE immersion oil 1992
- First 37DF immersion oil 2008
- First LIVE CELL FLUORESCENCE immersion oil at 37°C 2009

Key optical characteristics make immersion oil function as a high quality component of the optics of the microscope. Cargille Laboratories was the first manufacturer to print key optical and physical values on every bottle of immersion oil. This makes referencing the data, and the selection process, easy and accurate.

This selection process is further simplified in the lab by color coding all bottle and package labels.

Today, Cargille Immersion Oils are accepted by all microscope manufacturers. Cargille provides the largest line of immersion oils for traditional and specialty uses, and continues to set performance standards in product development, refinement and support services.

Cargille Immersion Oils Meet or Exceed the ISO 8036-1 Standard

The required specifications for immersion oil are in the International Standards Organization (ISO) 8036-1 which incorporates and supersedes the DIN 58 884. All but three of Cargille Immersion Oils meet the ISO standards. The other three Cargille oils are for more highly specialized applications and used in non-standard conditions not yet addressed by ISO requirements.

Cargille Laboratories served as a member of the U. S. delegation to the International Standards Organization and helped write the ISO specifications for immersion oils in conjunction with microscope manufacturers worldwide.

Biosciences, Clinical, Hematology and Pathology Labs

Specifications for Cargille Immersion Oils also meet the U.S. FDA criteria for *In Vitro* Diagnostics, General Purpose Reagents, and have been adopted for use by the U. S. Department of Defense.

The physical and optical properties of immersion oil are critical to the proper operation of Automated Hematology Systems. Type 300 is designed and manufactured to meet the stringent requirements of this equipment, which include specialized viscosity and exacting controls for its consistency.

Types A and B are sufficiently low fluorescing for most fluorescence microscopy applications. ~~Extremely low fluorescence is achieved by Type DF.~~ Type FF is virtually fluorescence-free, though not covered by ISO. Viscosity for Type A is 150 cSt, Type B is 1250 cSt, ~~Type DF is 330 cSt~~ and Type FF is 170 cSt.

Type 37DF was developed specially for research projects that require Fluorescence Microscopy at internal human body temperature. Type 37DF, with a refractive index of 1.515 and viscosity of 250 cSt at 37°C, solves the problem of image deterioration at temperatures above the standard calibration temperature of 23 °C.



CARGILLE IMMERSION OILS

What Application – What Type – Which One to Choose?

Normal Light Microscopy:	Use Type A or Type B	<p><u>Types A and B</u> are virtually interchangeable and are miscible with each other for intermediate viscosities. Produced in larger quantities than other types, <u>Types A and B</u> are the most economical. The deciding factor in choosing between them is the optimum viscosity for your particular application. (Please refer to the chart of Relative Viscosities on page 3.)</p> <p><u>Type A</u>, at 150 centistokes, reduces any tendency to trap air, especially helpful to beginning students. Air bubbles cause image degradation.</p> <p><u>Type B</u>, at 1250 cSt, is thick enough for viewing multiple slides with one application. This saves time during batch processing.</p>
Automated Hematology Systems:	Use Type 300	<p>AUTOMATED HEMATOLOGY SYSTEMS depend on accurate, precisely controlled physical and optical properties of immersion oil for successful imaging and mechanical processing. <u>Type 300</u> is designed and manufactured to meet the stringent requirements of this equipment, which include specialized viscosity and exacting controls for its consistency.</p>
Inverted, Inclined, Projection, and Long Focus Instruments:	Use Type NVH or Type OVH	<p>The greater the gap between the cover glass and objective, or between the slide and condenser, the more desirable high viscosity becomes. The very high viscosities of <u>Type NVH</u> at 21,000 cSt and <u>Type OVH</u> at 46,000 cSt give excellent results for these applications.</p>
Blending Oils from the Miscible Group of immersion oils to obtain intermediate viscosities:	The Miscible Group of immersion oils is A, B, 300, NVH & OVH.	<p>Users can easily blend any two immersion oils from the Miscible Group to obtain an immersion oil with an intermediate viscosity while maintaining the optical properties common to both oils.</p>
Fluorescence Microscopy:	Use Ultra-Low Fluorescing Type DF, Type HF, Type FF or Type 37DF	<p>Extremely low fluorescence is achieved by <u>Type HF</u>. <u>Type FF</u> is virtually fluorescence-free, though not ISO compliant. <u>Type HF</u> is halogen-free. For most non-critical fluorescence microscopy applications, <u>Types A and B</u> are sufficiently low fluorescing. Viscosities for <u>Types HF and FF</u> are 700 cSt and 170 cSt, respectively. <u>Types A and B</u> are 150 cSt and 1250 cSt.</p>
Elevated Temperatures (>23 °C to 37 °C)	Use Type 37*	<p>Elevated temperatures can be due to substage illuminators, "hot stage", or other causes – ideal situations for Cargille Immersion Oil <u>Type 37</u>. Developed specifically for working at human body* temperatures, <u>Type 37</u> has a refractive index of 1.515 and a viscosity of 1250 cSt at 37 °C, solving the problem of image degradation above the standard calibration temperature of 23 °C.</p>



Blending for Intermediate Working Temperatures From 23 °C to 37 °C

Users can blend for their own working temperature; blending Type B, with a viscosity of 1250 cSt at 23 °C with Type 37, 1250 cSt at 37 °C maintains a constant 1250 cSt viscosity and optical values and places the temperature of calibration proportionally between 23 °C to 37 °C.

(*For In Vitro use only: immersion oil has no In Vivo applications.)

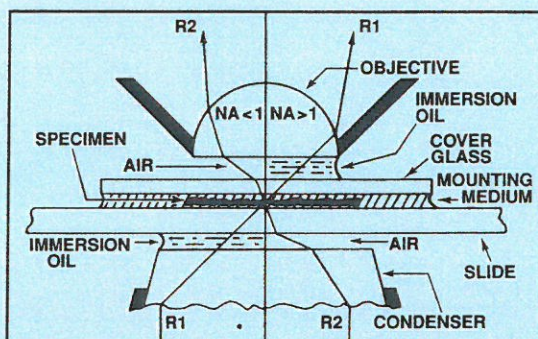


CARGILLE IMMERSION OILS

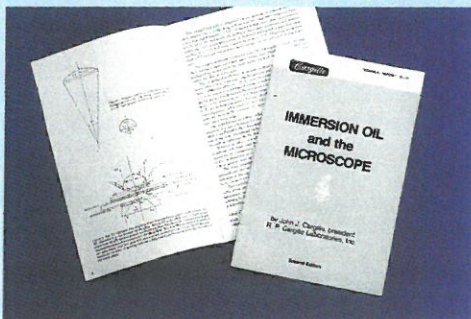
How Immersion Oils Work

Sharper resolution and increased brightness are achieved with oil immersion microscopy:

1. An objective must be used "dry" or "oiled" depending on design, and is marked specifically for use with oil. A condenser will work oiled or dry.
2. The glass of the objective and condenser lenses and the slide and cover glass each have a refractive index of 1.515. Air has a refractive index of 1.000 and is a distorting factor.
3. By replacing the air gap between the condenser and slide and between the slide and objective with immersion oil with a refractive index of 1.515, the best resolution of the image is realized.
4. Cargille Immersion Oil has the specific refractive dispersion necessary to reduce chromatic aberration and maintain the proper color of the image.



For a more detailed explanation of the physics, optical contribution, and use of immersion oil, including angular and numerical apertures, request a free copy of the booklet *Immersion Oil and the Microscope* by John J. Cargille, reprinted by permission of the New York Microscopical Society.



Relative Viscosities

Viscosity In Centistokes	Cargille Immersion Oil Type	Common Liquids	Viscosity In Centistokes
—	—	water	1 cSt
—	—	salad oil	50 cSt
150 cSt	TYPE A	maple syrup	165 cSt
170 cSt	TYPE FF	dish detergent	225 cSt
250 cSt	TYPE 37DF*	motor oil 10W	225 cSt
300 cSt	TYPE 300	motor oil 30W	285 cSt
330 cSt	TYPE DF	glycerin	550 cSt
1,250 cSt	TYPE B	corn syrup	1,760 cSt
1,250 cSt	TYPE 37*	molasses	2,500 cSt
21,000 cSt	TYPE NVH	honey	15,000 cSt
46,000 cSt	TYPE OVH	(3.07 x honey)	—

*@ 37 °C.

Special Applications of Cargille Immersion Oils

Worldwide distribution and rigidly maintained manufacturing specifications allow Cargille Immersion Oils to be used at coordinated work sites around the globe with thoroughly consistent quality results for applications such as:

- temporary mounting media
- fluid mount (permitting specimen rotation)
- calibration liquids
- optical coupling
- transparency medium for translucent materials and as a filter clearing agent.
(recommended by Millipore Corp.)

Cal. No. 16482

Cargille non-drying
IMMERSION OIL
for microscopy

120 cc - 4 fl. oz.

$n_D^{20} = 1.5150 \pm 0.0002$
 $n_D^{Temp. Coef} = +0.00033/^\circ C$
 $n_F = 1.5180 \pm 0.0002$
 $n_F - n_D = 0.0124$
 $Abbe V_D = 41.6$
 $Abbe V_F = 41.2$
 $Viscosity, cSt = 150 \pm 10\%$
 $Fluorescence = Low$
 $Refer to Data Sheet 3D$
 $for other properties.$
 $*Relative to Cedarwood Oil$
 $Patented$

TYPE A
FORMULA: CODE 1248
STANDARDIZED AT 23 °C
CONFORMS TO ISO-9005-1 SPECIFICATIONS
Store at 4 ° to 40 °C
For Laboratory Use Only
MSDS Available

Safe-for-lens/optics, safe-to-handle, easily removable, stable, non-hardening, non-drying, clear, odorless, and miscible with types A & NVH for intermediate viscosities. No solvents, no polychlorinated biphenyl (PCB) compounds, resins or hardening components. Formulated from synthetic hydrocarbons and natural petroleum derivatives.
Made in USA
L-10A176P

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CARGILLE IMMERSION OILS

Optical and Physical Properties

Property values most often requested

Category:	Standard Viscosities				Extra Thick		Fluorescence Microscopy			Halogen-Free
Type of Oil:	Type A	Type 300	Type B	Type 37**	Type NVH	Type OVH	Type 37DF**	Type DF	Type FF	Type HF
Miscible Group:	yes	yes	yes	n/a	yes	yes	n/a	n/a	n/a	n/a
ISO Compliance:	yes	yes	yes	***	yes	yes	***	yes	****	yes
Catalog No.:	16482	16252	16484	16237	16485	16487	16239	16242	16212	16245
Viscosity: cSt \pm 10% @ 23 °C (centistokes)	150 low	300 medium	1250 high	(@ 37 °C) 1250** high	21,000 very high	46,000 very, very high	(@ 37 °C) 250 medium	330 medium	170 low	approx. 700 medium
Refractive Index @ 23 °C:										
F Line (4861 Å)	1.5239	1.5238	1.5236	1.5238**	1.5230	1.5230	1.5233**	1.5232	1.4850	1.5234
E Line (5461 Å)	1.5180	1.5180	1.5180	1.5180**	1.5178	1.5178	1.5179**	1.5179	1.4811	1.5180
D Line (5893 Å)	1.5150	1.5150	1.5150	1.5150**	1.5150	1.5150	1.5150**	1.5150	1.4790	1.5150
C Line (6563 Å)	1.5114	1.5115	1.5116	1.5115**	1.5118	1.5118	1.5117**	1.5116	1.4766	1.5117
Dispersion:										
$n_F - n_C$	0.0125	0.0123	0.0119	0.0123**	0.0113	0.0111	0.0116**	0.0117	0.0084	0.0118
Abbe v_D	41.3	41.8	43.2	42.0**	45.7	46.3	44.3**	44.2	57.0	43.8
Abbe v_e	41.0	41.5	42.8	41.7**	45.4	46.0	44.0**	44.0	56.5	43.6
Temperature Coefficient: (15-40 °C) $\frac{dn_D}{dt}$	-0.00033	-0.00033	-0.00031	-0.00035**	-0.00034	-0.00034	-0.00040**	-0.00039	-0.00037	-0.00038
Stability: change in n_D^{25} °C after 24 hrs. @ temp.										
60 °C:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	+0.0001
100 °C:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	+0.0002	+0.0002	0.0000	+0.0006
Fluorescence* (UV):										
Short Wave:	low	low	low	low	low	low	very, very low	very, very low	none	very, very low
Long Wave:	low	low	low	low	low	low	very low	very, very low	none	very low
Color: (Gardner)	1	1	1	1	1	<3	<1	<1	<1	<1
Density: @ 23 °C										
g/cc:	0.923	0.923	0.923	0.917	0.919	0.918	1.2494	1.225	0.877	0.9306
(US) lb/gal:	7.70	7.70	7.70	7.73	7.67	7.66	10.43	10.22	7.32	7.77
Cloud Point:	<-13 °C	<-13 °C	<-13 °C	<-13 °C	<-13 °C	<-13 °C	<-13 °C	<-6 °C	<-6 °C	2 °C
Flash Point: COC *****	325 °F	325 °F	325 °F	325 °F	325 °F	340 °F	199 °C / 390 °F	390 °F	420 °F	>340 °F
Neutralization No. (mg KOH/g)	0.01 max	0.01 max	0.01 max	0.01 max	0.01 max	0.04 max	0.86 max	0.15 max	0.01 max	0.03 max

* Relative to Cedarwood Oil.

** Values for Type 37 and 37DF standardized at 37 °C.

*** Meets ISO except for temperature.

**** Not ISO rated.

***** Cleveland Open Cup

See Back Page For Additional Information And Technical Literature.



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PAGE 4 OF 5

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CARGILLE IMMERSION OILS PRICE LIST

DESCRIPTION	CATALOG NO.	PRICE PER BOTTLE					
		1/4 oz. ††			1 oz. †	4 oz. †	16 oz. †
Type A	16482	ea:	\$ 9.75	ea:	\$11.50	\$ 24.75	\$ 50.25
Type B	16484	36:	\$ 6.25	doz:	\$10.00	\$ 22.00	\$ 45.00
		432:	\$ 6.00				
Type 300	16252	ea:	\$ 12.50	ea:	\$13.75	\$ 25.50	\$ 58.50
		36:	\$ 8.00	doz:	\$12.25	\$ 23.00	\$ 53.25
		432:	\$ 7.50				
Type NVH	16485	ea:	\$ 7.50	ea:	\$ 13.75	\$ 30.50	\$ 72.25
		36:	\$ 6.75	doz:	\$ 12.25	\$ 27.00	\$ 62.00
		432:	\$ 6.25				
Type FF	16212	ea:	\$ 10.75	ea:	\$ 14.00	\$ 31.25	\$ 74.00
		36:	\$ 6.50	doz:	\$ 13.25	\$ 28.25	\$ 66.75
		432:	\$ 6.00				
Type 37LDF	16240	ea:	\$ 11.25	ea:	\$ 16.75	\$ 34.50	\$ 80.50
Has distinct odor - request (M)SDS		36:	\$ 7.00	doz:	\$ 14.50	\$ 31.25	\$ 73.25
		432:	\$ 6.50				
Type LDF	16241	ea:	\$ 13.00	ea:	\$ 15.25	\$ 34.50	\$ 76.75
Has distinct odor - request (M)SDS		36:	\$ 8.00	doz:	\$ 13.50	\$ 31.25	\$ 69.25
		432:	\$ 7.50				
<i>These products are not available in 1/4 oz. bottles</i>							
Type HF	16245			ea:	\$ 15.25	\$ 32.50	\$ 76.75
				doz:	\$ 13.50	\$ 29.50	\$ 69.25
Type 37	16237			ea:	\$ 14.25	\$ 30.50	\$ 82.75
				doz:	\$ 12.75	\$ 27.00	\$ 71.00
Type OVH	16487			ea:	\$ 15.00	\$ 31.75	\$ 86.00
				doz:	\$ 13.25	\$ 28.25	\$ 73.75

† Amber glass bottles

†† Polyethylene bottles

Immersion Oil and the Microscope, by John J. Cargille, original reprinted from the 1964 New York Microscopical Society Yearbook.

In an update 1985 Second Edition©, Cargille Labs has a simple but comprehensive discussion of why Immersion Oils are necessary, their function, and their wide use in schools and laboratories for teaching students and technicians.

Free reprint are available at www.Cargille.com

SAMPLER: Poly-Pak	16490	ea:	\$ 24.75
5 x 1/4 fl. oz. polyethylene btls:		doz:	\$ 21.50
(2 ea: Type A			
1 ea: Types: 300, B, NVH)			
Dispensing Bottles:			
with glass applicator rods			
1/4 oz.	18507	doz:	\$ 34.25
1 oz.	18506	doz:	\$ 34.50

FOB & SHIPPING POINT:

Cedar Grove, NJ 07009 USA

Minimum Order:

USA, Canada, Mexico: \$ 50.00

International: \$ 70.00

See Sales Policy for full terms.

Prices Subject to Change Without Notice.

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