

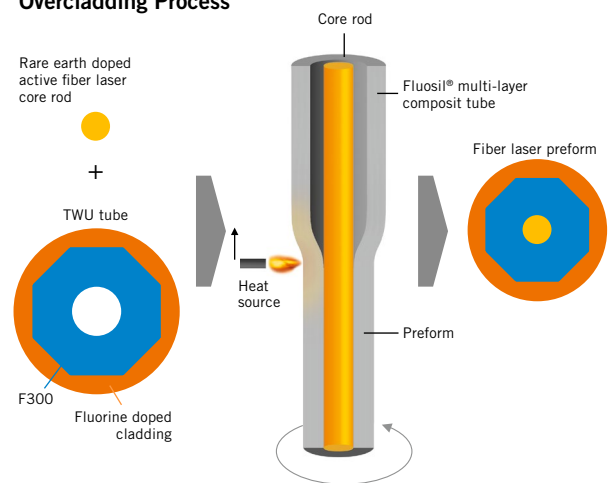
## Highly Fluorine Doped Tubes

Fluosil® tubes are characterized by the unique high fluorine concentration, which leads to a depressed index of refraction up to  $-26 \times 10^{-3}$ . Our Fluosil® tubes feature the highest fluorine content and therefore the lowest refractive index in the market. They can be manufactured as multiple layer composite tubes with a polygonal structure e.g. as pump cladding for fiber laser core rods.

### Typical applications include:

- Structured composite tubes to create laser fiber pump claddings
- Fluorine doped capillaries, e.g., for optical and viscosity matching

### Overcladding Process



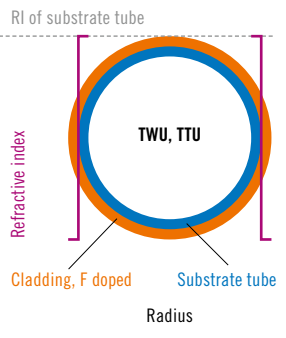
Available tubes			
		Composite tubes	
		TWU	TTU
Fluosil® layer	Refractive index*	0 ... -26 x 10 <sup>-3</sup>	
	OH [ppm] typical	1 ... 30	
	F [ppm]	0 ... 70,000	
Substrate tube	Substrate tube material	F300	F320
	Refractive index*	0.35 ... 10 <sup>-3</sup>	0.5 x -0.6 ... 1.2 x 10 <sup>-3</sup>
	OH [ppm] typical	< 1	< 1
	F [ppm]	-	3,000 ... 4,000

\* Difference to un-doped fused silica (Heraeus standard)

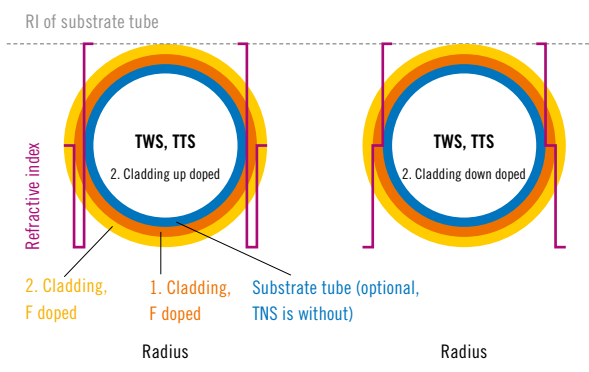
Uniformly fluorine doped Fluosil® tubes, referred to as U-types (TWU, TTU), are available. In addition, tubes are available with a double or multi step refractive index profile. These types are referred to as S-types (TWS, TTS).

**Typical geometries**

**U-Types – Typical Cross Sections and Refractive Index Profiles**



**S-Types – Typical Cross Sections and Refractive Index Profiles**



- Outer tube diameter: 10 ... 40 mm
- Fluorine doped wall thicknesses: 3 ... 15 mm
- Lengths: Up to 1,300 mm
- Other custom geometries available on request

**Special tube cross sections**

Beyond the standard cylindrical tube geometry, we also offer multi layer Fluosil® tubes with polygonal interface sections such as rectangular, square, hexagonal or octagonal.

**Physical Material Characteristics**

	Un-doped tube	F doped tube*
Refractive index @ 633 nm	1.4571	1.440
Refractive index @ 1,064 nm	1.4498	1.433
Transformation temperature	1,050 °C	750 °C
Fluorine content	0 wt %	5.0 wt %

\* Tube with Δn 17.1 x 10<sup>-3</sup> respectively un-doped fused silica

**About us**

Heraeus is the key global supplier of high purity synthetic fused silica products for optical fiber manufacturing. We have been a reliable partner in the world telecommunications industry since 1976.

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