

Temperature Change Resistant Titanium Objective Lens

- **High-precision machining ($\leq 1\mu\text{m}$) of titanium alloys**
- **Smaller aberration changes due to temperature changes (1/4 to 1/6 compared to conventional models)**
- **Smaller mass (3/5 compared to conventional models)**

Background of Development

Objective lenses with large NA and field of view have a problem that the aberration changes by the several degrees C environmental temperature change.

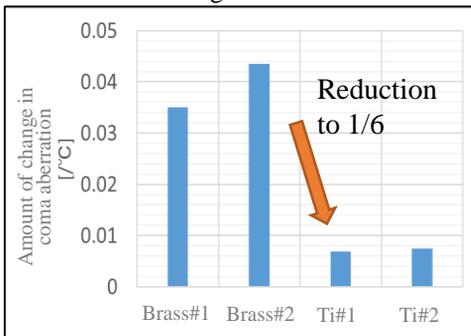
In general, lens barrel and lens frame of high-precision objective lens are made of brass, because of good workability. However, since the thermal expansion rate difference between brass and glass (general glass, i-Line glass) is large, when temperature changes, deviation occurs between lens and lens frame, and the aberration changes.

In order to solve this problem, we have made lens barrels and frames with titanium alloy, which thermal expansion coefficient difference with glass is small.

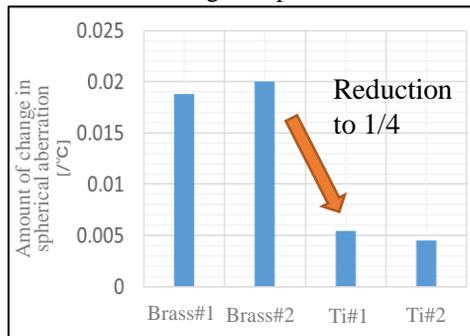
Though titanium alloy has difficulty in high-precision machining, we realized titanium alloy machining with the accuracy ($\leq 1\mu\text{m}$) which is equivalent to brass machining.

For the objective lens with titanium alloy lens barrel and lens frame, compared to objective lens with brass barrel and frame, the aberration change by environmental temperature change are small to 1/4~1/6, and mass is small to 3/5.

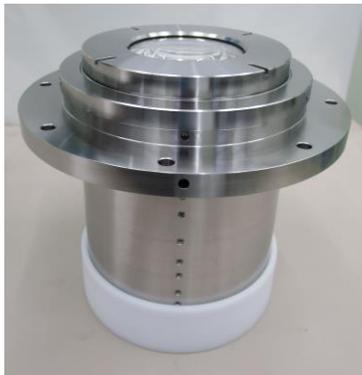
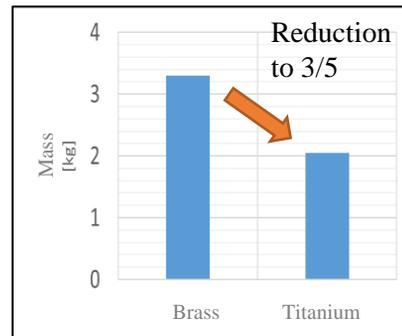
● Amount of change in coma aberration



● Amount of change in spherical aberration



● Mass



Specifications

- Wavelength: 355nm
- NA:0.55
- Focal length :35mm
- Field of view: $\phi 5.5\text{mm}$
- Glass materials: i-Line glass
- Metal materials: Titanium alloy
- Size: $\phi 85 \times 110\text{mm}$



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