



“Sunrise” over the Arctic Ice

Balloon flight for solar telescope equipped with lightweight “Zerodur” mirror begins

Esrang Space Center, near Kiruna (Sweden) / Mainz (Germany), June 10, 2009 — On Monday, “Sunrise” began its roughly five-day passage over the Arctic Circle. The solar telescope with a 1.1 meter aperture contains a mirror substrate made of the zero expansion glass ceramic “Zerodur” from SCHOTT. Lightweight structures made it possible to reduce the weight of the mirror substrate by around 85 percent.

North of the Arctic Circle, the sun shines around the clock in the summer. For this reason, the conditions could hardly be any better for the Max Planck Institute for Solar System Research’s (MPS) “Sunrise” mission. Its mobile research facility has its sights set solely on the sun while it is being carried by a special helium-filled balloon provided by NASA. At an altitude of about 37 km, polar winds will drive the solar observatory through the stratosphere over the North Atlantic and Greenland all the way to Canada for about five days.

“The balloon is not the only thing that makes this mission special,” explains Dr. Peter Barthol, the project manager from the Max Planck Institute for Solar System Research. “Sunrise will be observing the surface of the sun with a degree of accuracy that has never been achieved before by either a land-based telescope or a space probe. Now, it will be possible to visualize structures that are only about 35 kilometers in size,” he adds. The scientists are now hoping to thus be able to observe the fine structures of the sun’s magnetic field.

“Zerodur” with a lightweight structure

The telescope that captures sunlight and is thus able to provide the other scientific instruments on board with light represents the heart of “Sunrise”. It only weighs 350 kilograms, despite its four meters in length. This was made possible by a light

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construction that consists of carbon fiber supports that hold the instrument together. The telescope's primary mirror that is 1.1 meter in diameter is also a true lightweight.

The primary mirror that was manufactured out of the "Zerodur" zero expansion glass ceramic from SCHOTT weighs only 45 kilograms. The secret lies in the filigree lightweight structure of the backside of the mirror. Although some of the individual partition walls contained in the triangular honeycomb structure are only four millimeters thick, the mirror substrate remains extremely precise and stable. The processing work performed by the French company Sagem allowed for a reduction in weight of approximately 85 percent.

Precision for over 40 years

"Zerodur not only features the unique characteristic of zero expansion. The glass ceramic is extremely stable and, with a specific density of 2.53 g/cm³, even lighter than aluminum," explains Dr. Thorsten Döhning, Application Manager Astro/Space at SCHOTT. "With an optimized design and processing, SCHOTT itself could reduce weight by even more than 90%," he notes.

SCHOTT has been supplying large format mirror substrates made of "Zerodur" for astronomical observations all over the world since 1968. The reliability of this material for use in high precision applications has been documented already for decades. Weight plays a decisive role in large telescopes and aviation. The unique experience that SCHOTT has in melting and tempering the material, CNC and lightweight processing, as well as measurement technology, result in high project security and short delivery times.

SCHOTT is an international technology group that sees its core purpose as the lasting improvement of living and working conditions. To this end, the company has been developing special materials, components and systems for 125 years. The main areas of focus are the household appliances industry, pharmaceuticals, solar energy, electronics, optics and the automotive industry. The SCHOTT Group is present in close proximity to its customers with production and sales companies in all its major markets. The Group's approximately



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Caption no. 227905: "Sunrise" at the arctic circle: "Sunrise", the solar observatory attached to the helium-filled balloon lifts off from the European Space Center "Esrange" near Kiruna in northern Sweden. "Sunrise" carries the largest solar telescope ever to leave ground. On board: the lightweight 1.1m primary mirror made of the glass ceramic "Zerodur" from SCHOTT.



Photo caption no. 158711: Telescope mirror based on "Zerodur" from SCHOTT: For the Sofia telescope, a filigree lightweight mirror was



made from a glass ceramic substrate that originally weighed tons by grinding out material in the shape of honeycombs,.

More press photographs are available for downloading under:
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