Researchers design new support structure for space-based rectangular curved prisms

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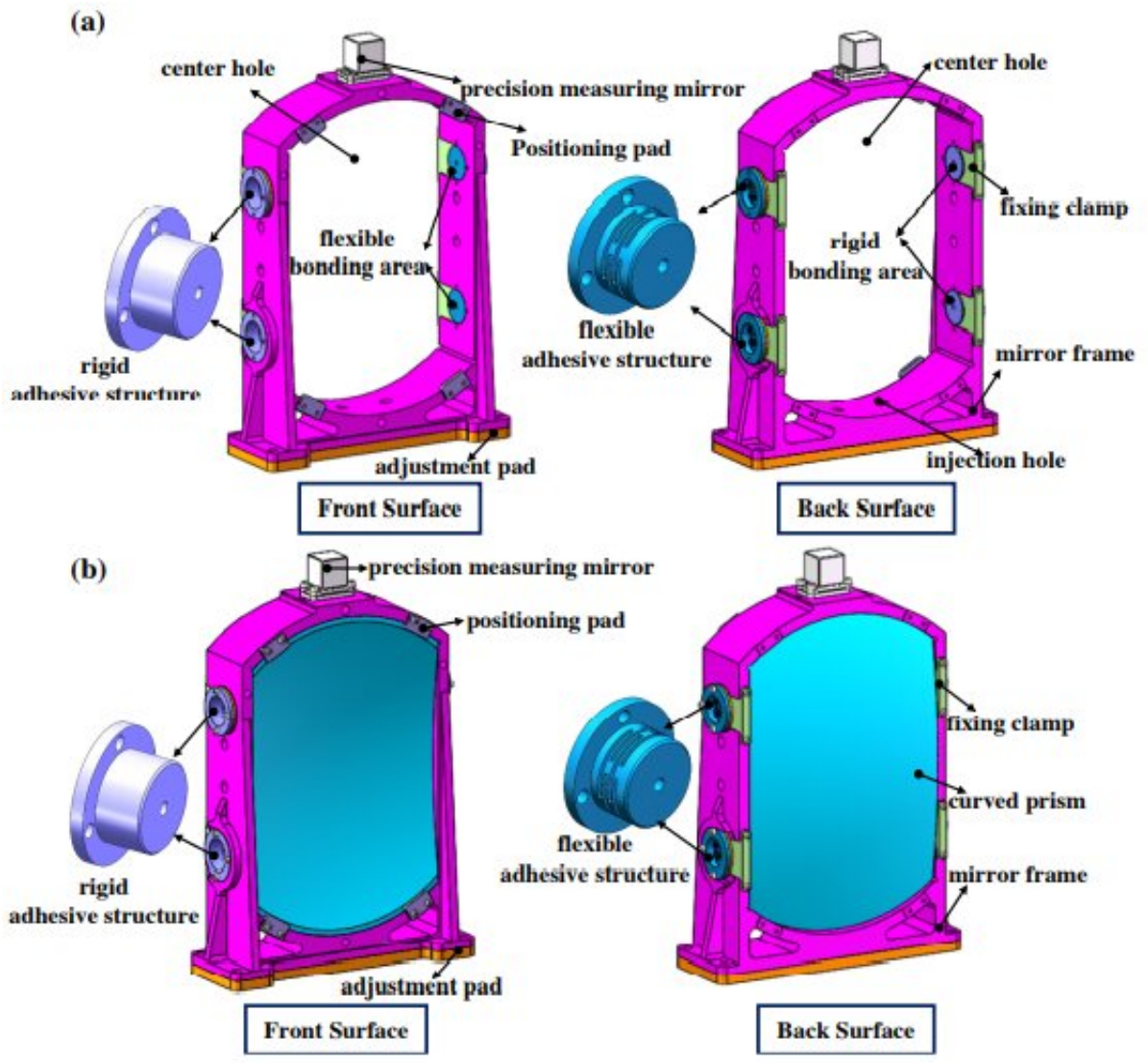

Rigid–flexible, dual-mode coupling support structure for the SRCP. Credit: XIOPM

In order to obtain stable and reliable optical components for space remote sensors, researchers have recently designed a rigid-flexible, dual-mode coupling support structure for space-based rectangular curved prisms (SRCPs). Results were published in *Applied Optics*.

Curved prisms have been widely used in the spectroscopic systems of remote sensors due to unique advantages of light splitting and imaging. However, curved prisms do not have a rotationally symmetric body, which raises problems in the fixed installation process.

Through in-depth theoretical analysis and repeated optimization, the researchers led by Prof. Dr. Hu Bingliang from the Xi'an Institute of Optics and Precision Mechanics (XIOPM) of the Chinese Academy of Sciences developed this rigid-flexible, dual-mode coupling support structure to achieve effective support of SRCPs.

As a compromise scheme, this structure is rigid enough to meet the index requirement of the system and ensures the local part is flexible enough to release different stresses. In this design, the support structure of the curved prism includes the mirror frame, two rigid adhesive structures, two flexible adhesive structures, four fixing clamps, four positioning pads, the adjustment pad and a precision measuring mirror.

Additionally, to facilitate the positioning of the supporting structure, the front surface of the curved prism was provided with two circular arc flat ends.

The simulation analyses and mechanical tests performed on this structure show that all indexes are better than the design requirements. Further systematic test results show that the proposed support structure can support optical elements with high accuracy and stability. Even under the influence of gravity load and temperature loads, the fabrication error, assembly error, and other factors, the surface shape error of the curved

prism subassembly is slight, ensuring the reliability of the support structure.

The researchers believed that this new designed structure could even bear the complex mechanical environment of vibration and shock when the satellite platform was launched.

More information: Xin-Yin Jia et al, Design analysis and test verification of a rigid–flexible, dual-mode coupling support structure for space-based rectangular curved prisms, *Applied Optics* (2021). DOI: 10.1364/AO.431394

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