

Window for high temperatures

High-pressure and vacuum-proof sapphire glass windows in a metal flange for high temperatures

Invention

For the monitoring of highly complex processes in closed reaction vessels, it would often be desirable to be able to observe the process and monitor it by means of optical measuring systems. The invention allows window flanges for use in pressure and vacuum containers for temperatures



up to 650 °C and pressures of at least 300 bar. A sapphire glass window with two different intermediate rings is soldered into a stainless steel flange using a special joining process. The two metallic intermediate rings consist of a material with very low thermal expansion, comparable to glass, and a soft metal, which by its softness can compensate mechanical tensions to the flange. The special shapes of both rings compensate for thermal and mechanical stresses in order to protect the viewing window from tension cracks. Due to the inventive joint geometry and soldering compounds, the material composite is gastight even at very high temperatures and pressures. The temperature strength of the new sealing technology has been demonstrated in extensive series of tests.

Commercial Opportunities

Glass-metal connections represent a particular challenge in container construction. There are only a few joining processes that allow a reliable connection of these very different materials, especially when a large temperature

range has to be covered in use. The new sapphire glass window allows to observe complex processes both in the autoclave and in the high vacuum chamber and to monitor them by means of optical measuring systems. Inventive window flanges allow process conditions above 300 bar and up to 650 °C. These values are not achieved with previously known state-of-the-art solutions. Although window flanges are already commercially available for appropriate applications, they do not reach such high temperatures and pressures at the same time. Advantageously, the production of the new sapphire glass windows does not entail any special additional costs.

Current Status

A working prototype of the invention has been tested and a patent application has been filed in Germany. On behalf of the University of Bonn PROVendis offers licenses for the invention to companies interested. Furthermore, PROVendis is seeking a partner for further development in view of licensing the technology.

An invention of University of Bonn.

Competitive Advantages

- Optical control
- Process monitoring of chemical reactions
- Vacuum-tight
- High-pressure resistant
- High-temperature resistant

Technology Readiness Level

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Technology demonstrated in relevant environment

Industries

- Mechanical engineering
- Container construction
- Chemical industry
- Sealing technology

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6003

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