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A SIMPLE BAKEABLE THIN FOIL VACUUM WINDOW*

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Thin-foil vacuum-tight windows of low Z material are used at high energy accelerators whenever the beam passes from vacuum to air. The use of low Z materials ensures negligible scattering of the primary beam. These windows are usually made of Al or Be, approximately 0.005" thick and are sealed using Indium and/or specially machined flanges or foils. Recently we required a thin foil window which was bakeable to 200 or 250°C for use in an ultra-high-vacuum system designed to measure the secondary emission from low-density alkali halides at relativistic energies. The following note describes a simple solution we found to this problem.

A sketch of the seal is shown in Fig. 1. The seal is accomplished by compressing a Cu gasket into the thin foil window. The flanges used were standard ConFlat ultra-high vacuum flanges available from Varian Associates and the Cu gaskets are the same as those normally used to seal the flanges together. Alcoa 3003 aluminum with an H19 temper was used in all tests and was cut to size with a pair of scissors. The type 316 stainless steel bolts used to clamp the flanges together were lubricated with colloidal copper and torqued to produce a stress close to the yield value for these bolts. The only special machining involved in making the window is forming of the radius on the Cu gasket situated on the vacuum side of the foil.

Both 0.002" and 0.005" Al windows of 1-1/2" and 4" dia. have been found to have a leak rate for helium less than 5×10^{-10} std. cc/sec. Windows with 0.005" thick foil and 4" dia. have been baked with one side in atmospheric air and the other under vacuum for 24 hrs. at 260°C, and 0.002" thick windows with 1-1/2" dia. have been baked at 180°C overnight without developing leaks. It is possible that a tempered alloy, e.g., 2024-T3 Al at studied by Cleland and Prepost for pressure windows,[1] would allow bakeout at higher temperature.

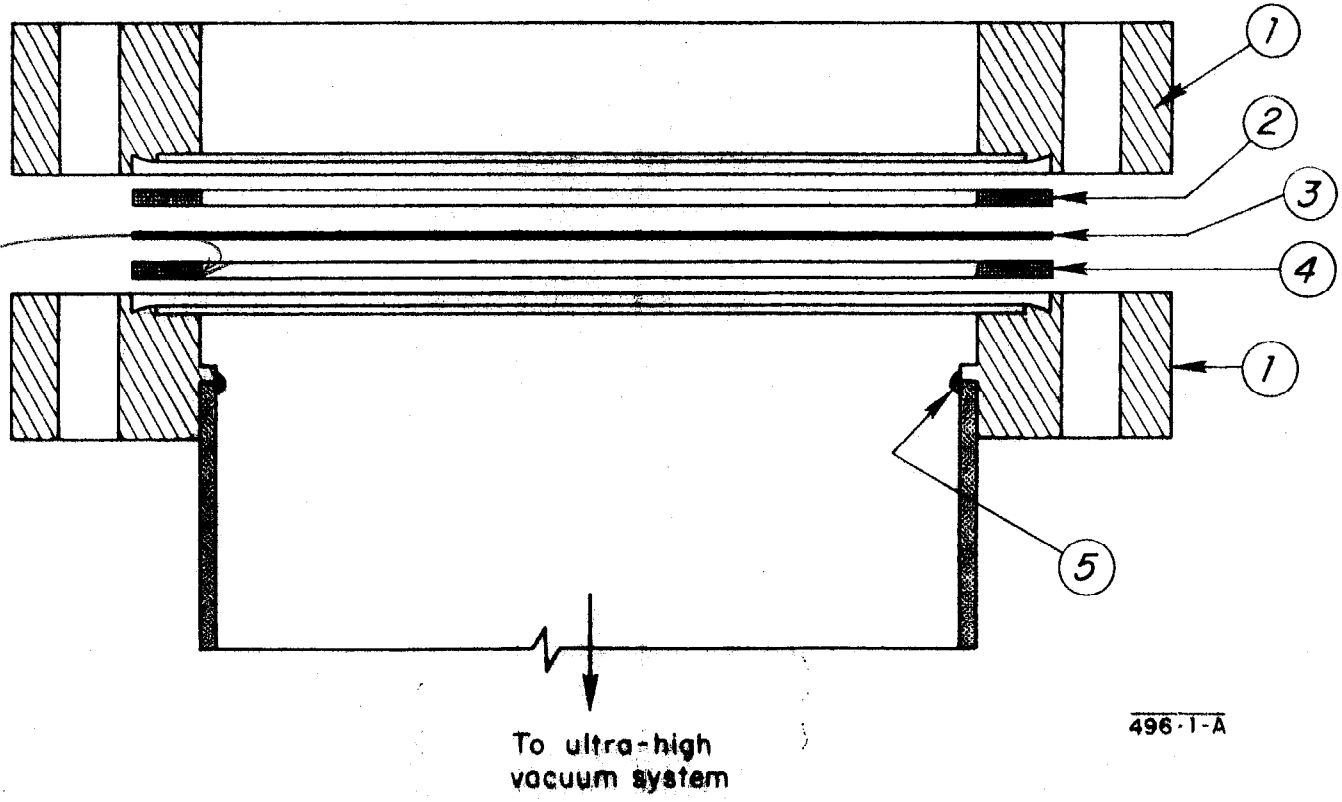
It seems reasonable that this seal could be used with Be windows and with Ag and Ag-Pd diaphragms used in O_2 and H_2 leaks. Also, because of its simplicity it should be useful in vacuum systems requiring a rupture diaphragm to prevent overpressurization.

The author would like to thank Mr. C. L. Thurman for carrying out most of the tests on these windows.

Reference

1. W. E. Cleland and R. Prepost, Rev. Sci, Instr. 36, 1881 (1965).

Fig. 1--A bakeable thin foil vacuum window.
1. Varian ConFlat flange. 2. Standard Cu gasket normally used to seal flanges together. 3. Thin foil window. 4. Cu gasket with radius on ID equal to the thickness of the gasket. 5. Heli-arc weld connecting flange to the vacuum system.



the radius is not clear enough.

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