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Diamond-Edge Gaskets for the Ultrahigh Vacuum Systems

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A special designed aluminum diamond-edge (DE-) gasket was applied to seal the aluminum vacuum chamber on the diamond-edge flat (DEF-) flange, instead of the traditional assembly of the aluminum metallic gasket with the ConFlat (CF-) flange, can achieve the ultrahigh vacuum (UHV) specified leak rate < 1x10-10 Pa·m3/s and the ultimate pressure of < 10-8 Pa. Since both the DE-gasket and the DEF-flange, made of A1050 and A6061T6 aluminum alloys respectively, are manufactured by the CNC machining with the special tools, therefore the cross section of the flanges and gaskets can be made either in circular shape or in other non-circular shapes, e.g. the rectangular, racetrack, or elliptical shapes. For the ultrahigh vacuum systems, the chambers made of aluminum alloys with the DEF-flanges and the aluminum DE-gaskets sealing can be customer-designed and machined easily. No further cleaning for the aluminum chambers is necessary if adopting the oil-free ethanol CNC machining process. The features of the DE-gasket include: (1) flexible dimensional changes from smaller to larger or from uniform to non-uniform, (2) flexible cross section changes from circular to non-circular, (3) wide range of vacuum extends from 1 atm to the ultrahigh vacuum, (4) more tolerance of mounting accommodates the DE-gasket to the flat DEF-flange, (5) DE-gasket can be reused few more cycles if still compressible. The assembly of the DE-gasket and the DEF-flanges provides reliable sealing-capabilities, flexible and easier machining properties, that is applicable for all the UHV systems including the aluminum ones. Several experimental results will be addressed in this presentation.

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