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Development of a Process Chain for Structuring and Coating of AlN Ceramic for Ion-Traps

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An integrated laser-processing and coating process for the fabrication of AlN sintered ceramics ion-traps to be used as the centre-piece of novel optical clocks was developed. AlN was used for its ideal properties with respect to the subsequent laser-cutting and structuring process.

A polished AlN tile (thickness approx. 0,4 mm) was patterned using a UV-laser and a 4-axis high precision robotics. To prevent contamination a protective coating was applied. After thorough cleaning the tile was coated with up to 5 µm of gold and a thin Titanium adhesive layer. To further enhance adhesion by means of stress release the tile was annealed in a vacuum furnace. Hereafter conducting paths were structured by evaporating the gold coating using the laser-robotics again.

Under the influence of the UV-laser the surface of the semiconducting AlN ceramic transforms into a conducting Al layer with a thickness of up to several micrometers. The Al layer is removed using buffered phosphoric acid.

After cleaning and testing for shorts surface-mounted devices can be soldered by standard means.

Keywords

Laser-processing

gold coating

ion-traps

optical clocks

structuring