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Optimization of stimulated outgassing for particle accelerator vacuum components

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High intensity particle accelerators suffer from outgassing of components stimulated by beam operation. This meanwhile well-understood phenomenon limits the beam intensity and / or lifetime. In recent years, a simple, yet effective method was developed for the conditioning of accelerator parts prior to their installation. In principle, the method is a specialised annealing in a UHV furnace that drives volatile gaseous species out of the material and reduces the area of grain boundaries that is most probably the dominating way of gas diffusion.
Albeit this method is fairly good established, there is still outgassing from layers close to the surface. At present, some methods for surface conditioning are under investigation, whereas the most promising ones are sputtering and ion etching in combination to thermal treatment.
In the talk, results of the last years will be given, including bulk annealing and some surface optimization techniques. Further methods such as laser polishing will be shortly discussed and the potential of tailoring technical materials for general vacuum applications including hydrogen diffusion and storage for future energy and mobility concepts will be mentioned.

Author: BENDER, Markus (GSI Helmholtzzentrum für Schwerionenforschung GmbH(GSI))

Co-authors: KIRSCH, Leon (GSI); Dr VELTHAUS, Verena (DLR)

Presenter: KIRSCH, Leon (GSI)

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