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► **To cite this version:**

Sylvain Lemettre, Clément Bessouet, Charlotte Kutyla, Alain Bosseboeuf, Philippe Coste, et al.. Integration of Zr-V getter films in MEMS packaging. 22nd International Vacuum Congress, Sep 2022, Sapporo, Japan. hal-03836067

**HAL Id: hal-03836067**

**<https://hal.science/hal-03836067>**

Submitted on 1 Nov 2022

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# Integration of Zr-V getter films in MEMS packaging

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Films of Ti-Zr-V were extensively studied for their use in Ultra-High Vacuum (UHV) systems like particle accelerators since the end of 20<sup>th</sup> century [1]. The conditions of activation of a getter in a MEMS packaging and in a particle accelerator are very different [2]. This could explain why in MEMS vacuum packaging, the most used getters are Ti and Zr-Co-RE and the use of Ti-Zr-V was never reported. Thus we investigated the usefulness of the Zr-V films for MEMS packaging.

Films of Zr-V with various Zr content were co-evaporated on square silicon samples and on silicon MEMS caps. Films with high and low Zr content are nanocrystalline, while others are amorphous, as characterized by TEM. First the square samples were annealed under argon with traces of oxidizing gases at temperatures ranging from 200 °C to 400 °C and their oxygen content was measured by Nuclear Reaction Analysis (Fig. 1). Secondly the caps were sealed with a MEMS sensor at 300 °C under high vacuum and the resulting internal pressure inside the micropackages was measured by the quality factor of the MEMS and Residual Gas Analysis (Fig. 2). In both experiments, the Zr<sub>85</sub>V<sub>15</sub> nanocrystalline film exhibited the best sorption performance compared to the Zr<sub>50</sub>V<sub>50</sub> and Zr<sub>30</sub>V<sub>70</sub> amorphous films.

These results show the interest of using Zr-V getter for MEMS packaging and the existence of an optimum of sorption performance between nanocrystalline and amorphous film microstructure.

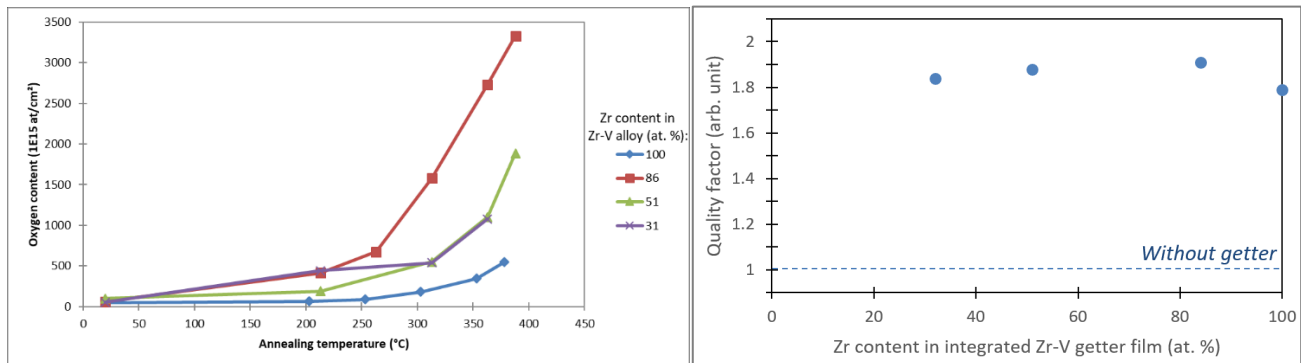


Fig. 1 (left): Oxidation of annealed films; Fig. 2 (right): MEMS quality factor packaged at 300 °C

## References:

[1] C. Benvenuti et al, Vacuum 60 (2001) 57-65

[2] A. Bosseboeuf et al, Sens. Mater., Vol. 31, No. 9, 2019, p. 2825-2849