

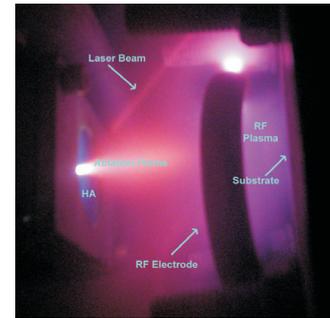
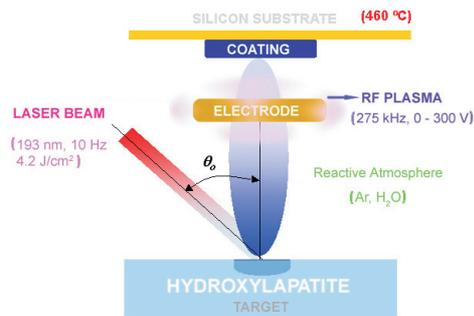
Aim

The investigation of the effect of different reactive gas atmospheres and the incorporation of a RF plasma source in the pulsed laser deposition of hydroxylapatite coatings

Material: Hydroxylapatite

- * Calcium phosphate compound with formula: $[Ca_{10}(PO_4)_6(OH)_2]$.
- * Main bone constituent.
- * Coatings of HA are used in implant technology to improve the bonding of prostheses to the bone.
- * Its most important property is the ability of bond formation with living tissue.

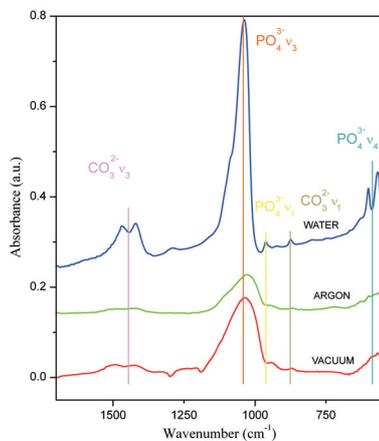
Method: Radiofrequency Plasma Assisted Pulsed Laser Deposition



Results

Influence of the atmosphere

FTIR Analysis

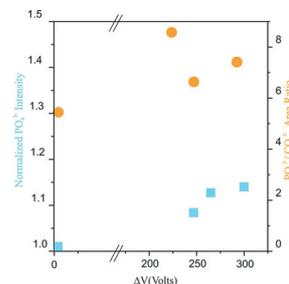
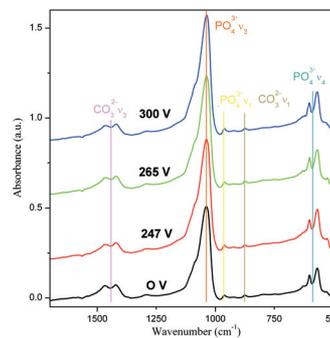


Compared to Ar and vacuum, water vapour atmosphere induces:

- * Increase of the crystallinity grade, indicated by the sharpness of the FTIR peaks.
- * Structural changes in the lattice, indicated by the $PO_4^{3-} v_3$ shifting.
- * Higher deposition rate, indicated by the intensity of the peaks.

Influence of the RF plasma

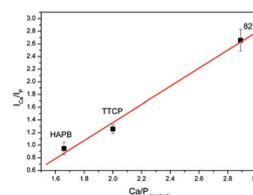
FTIR Analysis



- * The increase of the intensity of the $PO_4^{3-} v_3$ band indicates an increase of the film growth rate.
- * The increase of the PO_4^{3-}/CO_3^{2-} ratio indicates a diminution of the CO_3^{2-} groups which improves the crystallinity grade of the films.

EDS Analysis

Calibration Plot



Ca/P measured with standards

RF ΔV (V)	Ca/P ratio
0	1.92 ± 0.02
247	1.89 ± 0.01
265	1.89 ± 0.02
300	1.91 ± 0.01

* The Ca/P ratio was calculated with the calibration plot using three standards of Calcium Phosphate.

* The Ca/P ratio is an important parameter to assess the quality of the HA films.

* The RF plasma does not seem to affect the ratio of Ca and P present in the films.

Conclusions

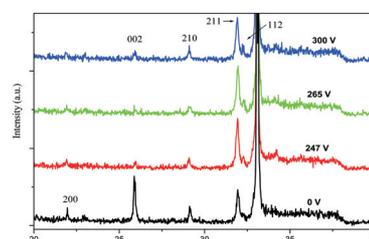
Pulsed Laser Deposition in a reactive atmosphere allows a fine control of the HA coatings properties.

The atmosphere plays an important role in the growth, bonding configuration and local structure of the PLD HA coatings.

The H_2O vapour atmosphere is the most appropriate one in order to obtain a crystalline coating.

RF plasma increases the deposition rate and improves the crystallinity of the HA coatings by diminution of the CO_3^{2-} groups.

XRD Analysis



* The (002) and (200) reflections present in the film deposited without RF plasma are clearly attenuated.

* The (211) and (112) reflections tend to be more well defined, which indicates less content of CO_3^{2-} groups.

* The diminution of CO_3^{2-} indicates an improvement of the crystallinity grade of the films. This result is in agreement with the FTIR analysis.

Acknowledgements