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Messrs. Titanmed s.r.l. unipersonale,
in the framework of the existing collaboration between your company and our research group, we are sending you this report regarding the results obtained by the XPS analysis of a sample that you sent to us. This report was written only for the aim of scientific research and is not a certification. Its use is authorized only in the framework of the research collaboration between Titanmed s.r.l. and Politecnico di Torino. We decline any responsibility for any use different from the authorized one.

XPS analysis of the sample: SPEEDY GR 04 H10 TU. COD. BRAIMP059 LOT. 002978

XPS (X-ray Photoelectron Spectroscopy) analysis was carried out at the Department of Applied Science and Technology (DISAT) of Politecnico di Torino. Three different sites were analyzed (neck, central region and tip). For each site, the analyzed area was (400 x 400) μm . Survey spectra were acquired (1200 - 0 eV) in order to identify the chemical species on the surface.

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Results: chemical composition of the surface

SAMPLE: SPEEDY GR 04 H10 TU. COD. BRAIMP059 LOT. 002978			
REGION	NECK (at.%)	CENTRAL REGION (at.%)	TIP (at.%)
C	23	22.9	23
O	57.2	56.3	57.1
Ti	9.9	9.5	9.8
P	8.5	8.3	8.5
Ca	0.8	1.2	0.8
Mg	0.3	0.9	0.5
Na	0.3	0.9	0.4

From the data reported in table above, it is possible to state that the following elements are adsorbed on the sample surface:

- carbon, uniform along the sample length
- phosphorus, uniform along the sample length
- calcium, slightly higher concentration in the central region of the sample
- magnesium, higher concentration in the central region of the sample
- sodium, higher concentration in the central region of the sample

Scientific literature reports the following typical conditions for XPS analysis of dental implants.

- Presence of a C content between 30% and 40% is often observed, and is considered normal, while greater concentrations are usually considered as a sign of contamination.
- The Ti concentration usually observed is between 14% and 20%. A concentration higher than 10% is usually considered satisfactory.
- The presence of a high amount of O is usually considered favorable for the osseointegration process. O concentrations higher than 40% are reported in literature.

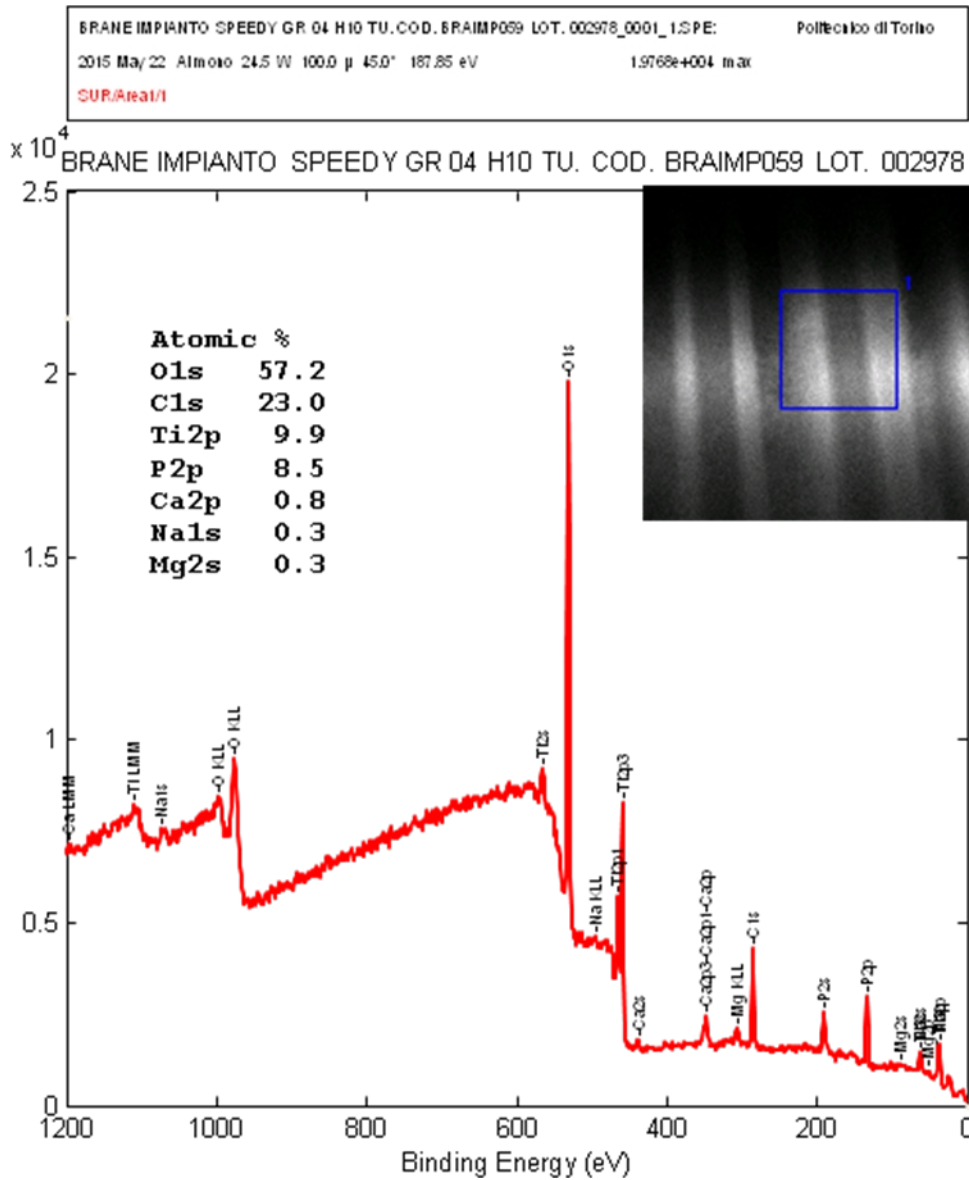
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- Besides O, T and C, other elements are often observed, such as Ca, Si, N, Cl, S, F, P, and others. Usually these are present with a overall concentration lower than 3%. The presence of Si, which is the second most common element on Earth after O, is very often observed.

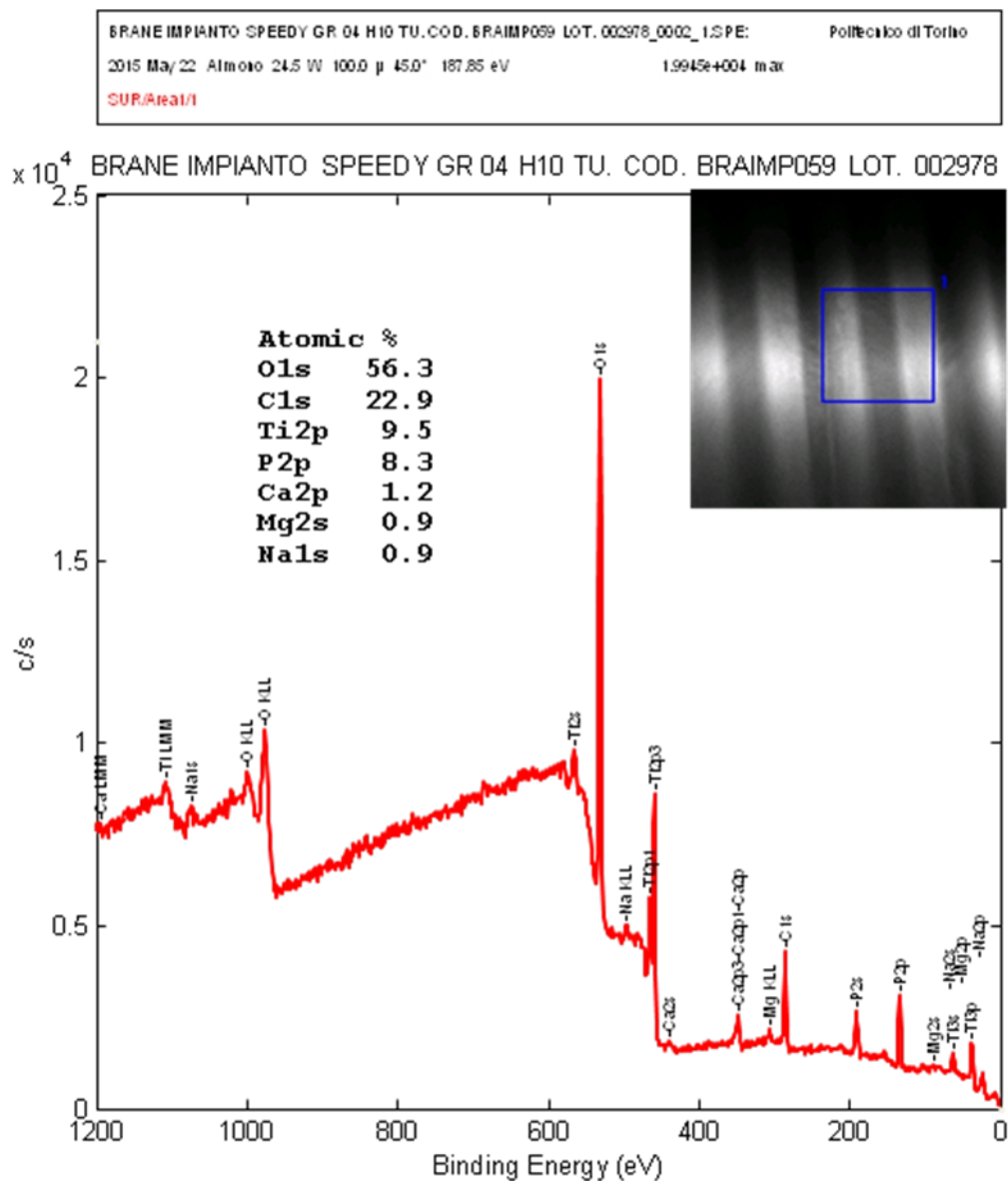
The conditions usually reported in literature to describe the chemical composition of a clean surface involve a O concentration much higher than 40%, a C concentration lower than 30%, and a Ti concentration higher than 10%, with the sum of the other elements lower than 3%.

APPENDIX: XPS spectra

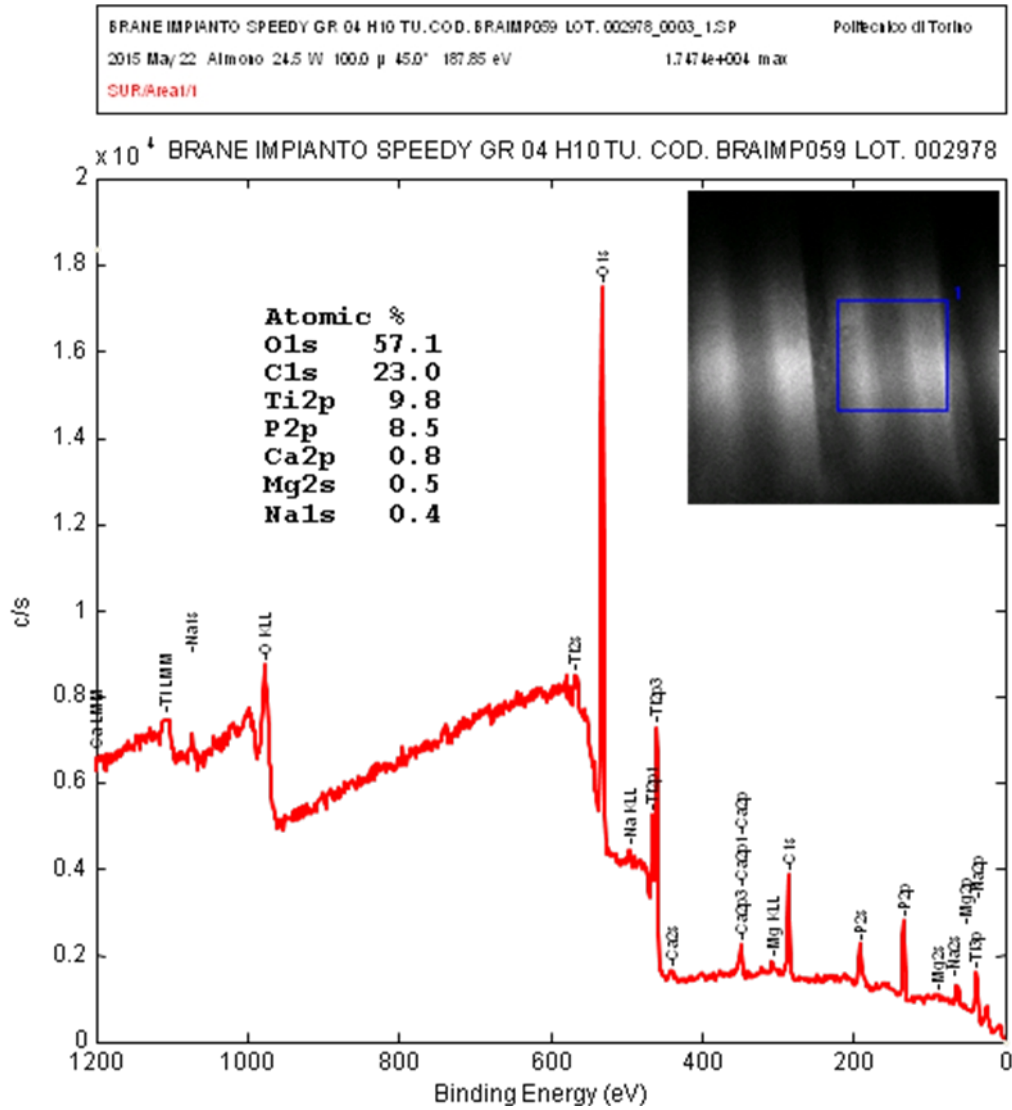
Neck



Central region



Tip



Pietro Mandracci