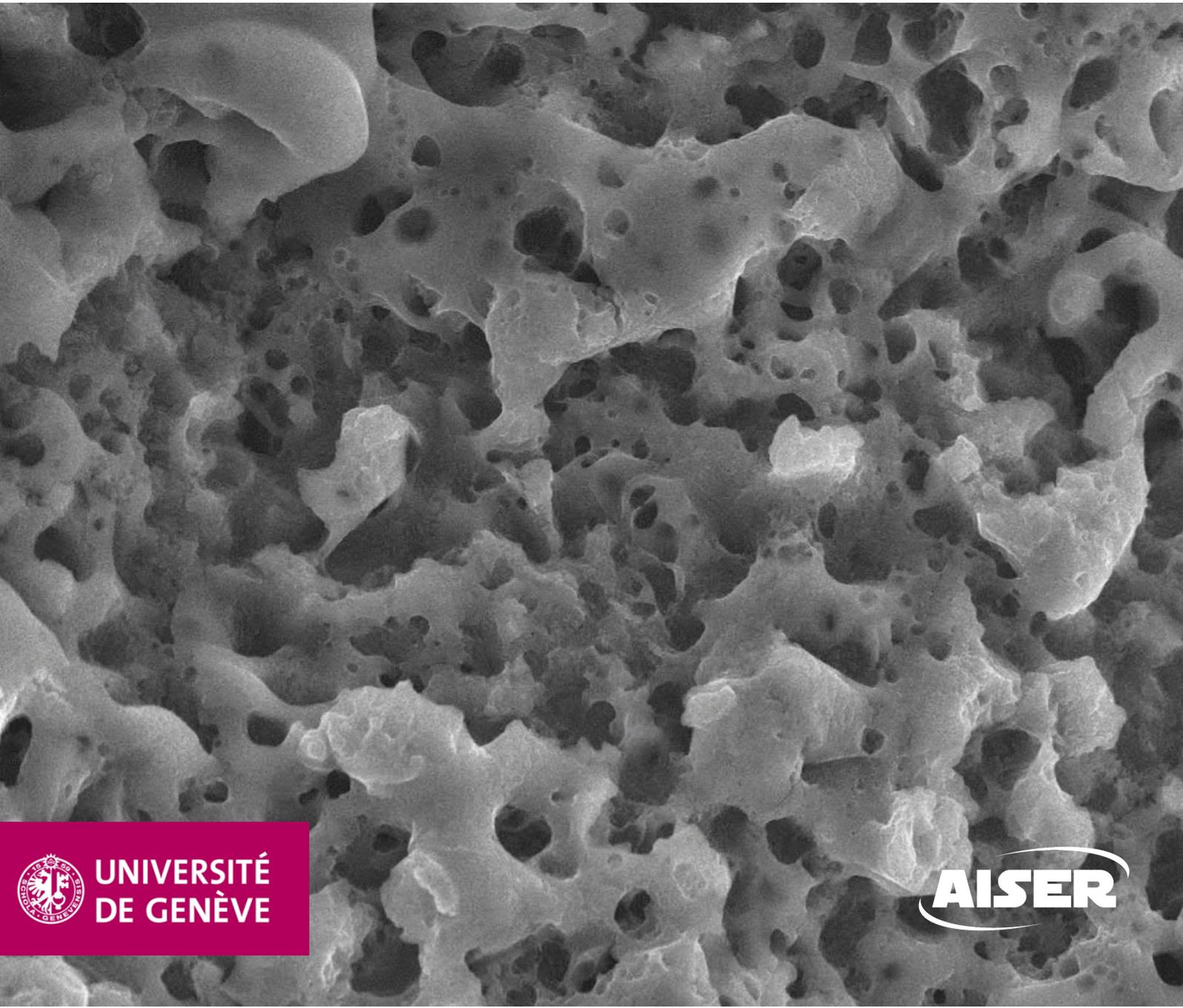




Surface and Biological characterization of AISER Biosyn-D®

DENTAL IMPLANT SURFACE FOR
ENHANCED OSTEOINTEGRATION



UNIVERSITÉ
DE GENÈVE



Technical Report



FACULTÉ DE MÉDECINE
**CLINIQUE UNIVERSITAIRE
DE MÉDECINE DENTAIRE (CUMD)**



**UNIVERSITÉ
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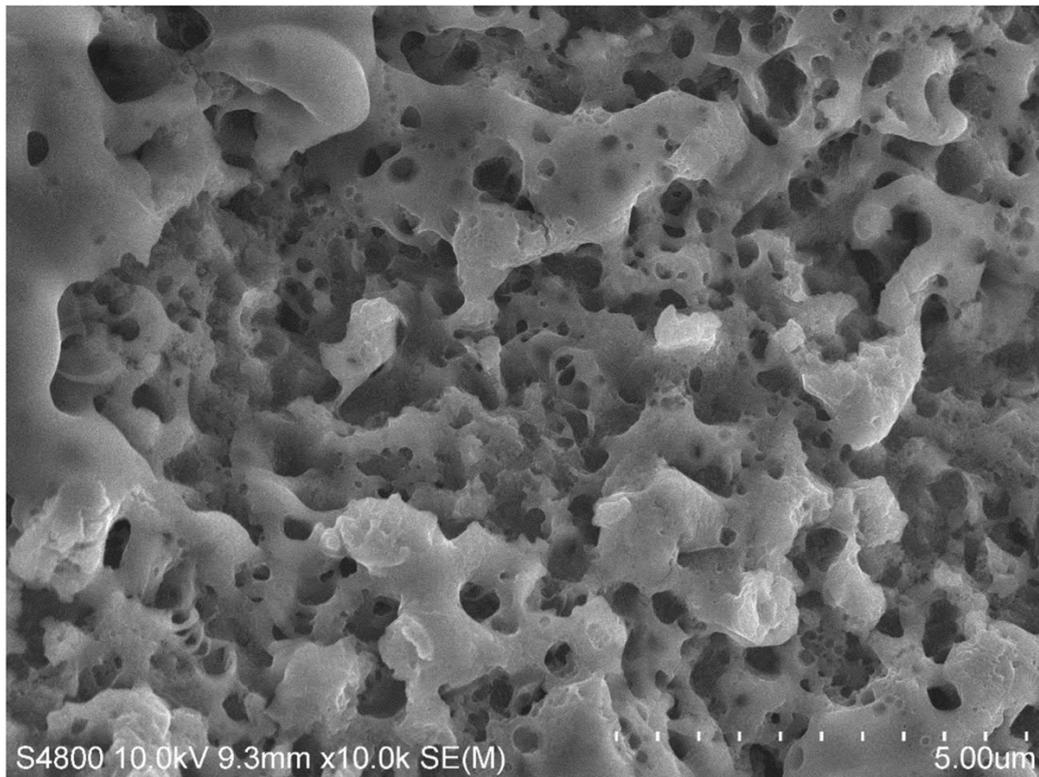
Study performed in collaboration with the biomaterial group of the University clinics of dental medicine of Geneva, Switzerland.

Division of fixed prosthodontics and biomaterials, Biomaterials laboratory, University of Geneva, 1, rue Michel Servet, 1204 Geneva, Switzerland.

Biosyn-D surface characterization

SEM SURFACE OBSERVATIONS & ANALYSIS

Biosyn-D surface Scanning Electron microscopy photo @ x10'000



EDS and XPS analysis show a highly oxidated with a relative oxygen content increased by more than 30% versus a regular Sandblasted/Etched Titanium dental surface.

The high oxidation of the surface will lead to better biocompatibility performance due to a more stable and bioactive surface.

The Surface Roughness parameters measured:

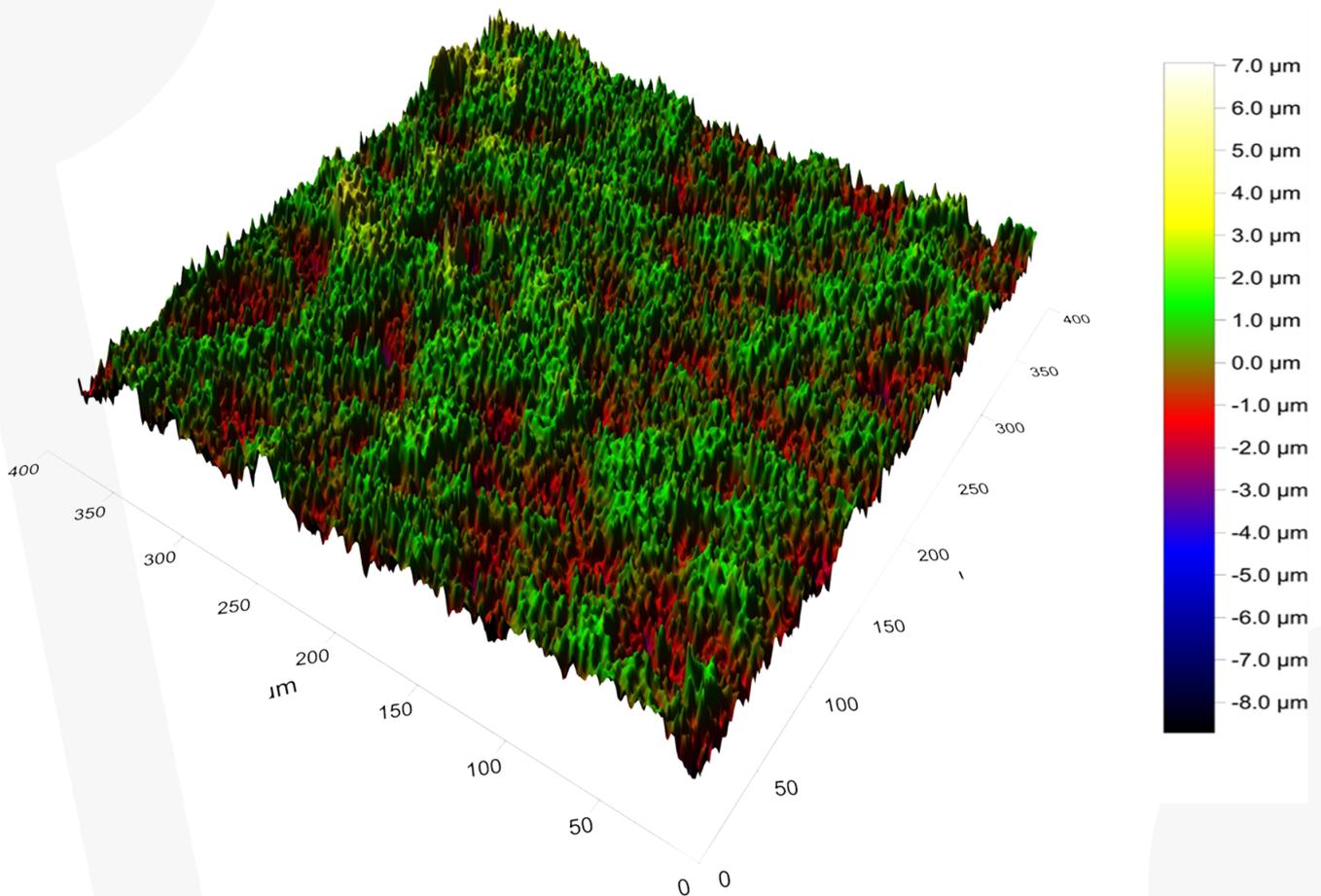
- Sa: arithmetic mean deviation is 1.05 ± 0.08 mm
- St: maximum peak-to-valley height 7.45 ± 0.13 mm

At a nanoscale level, the surface presents micro-holes which increase the active surface in contact with the bone.

It also favors osteoblast cell growth and proliferation.

Biosyn-D surface characterization

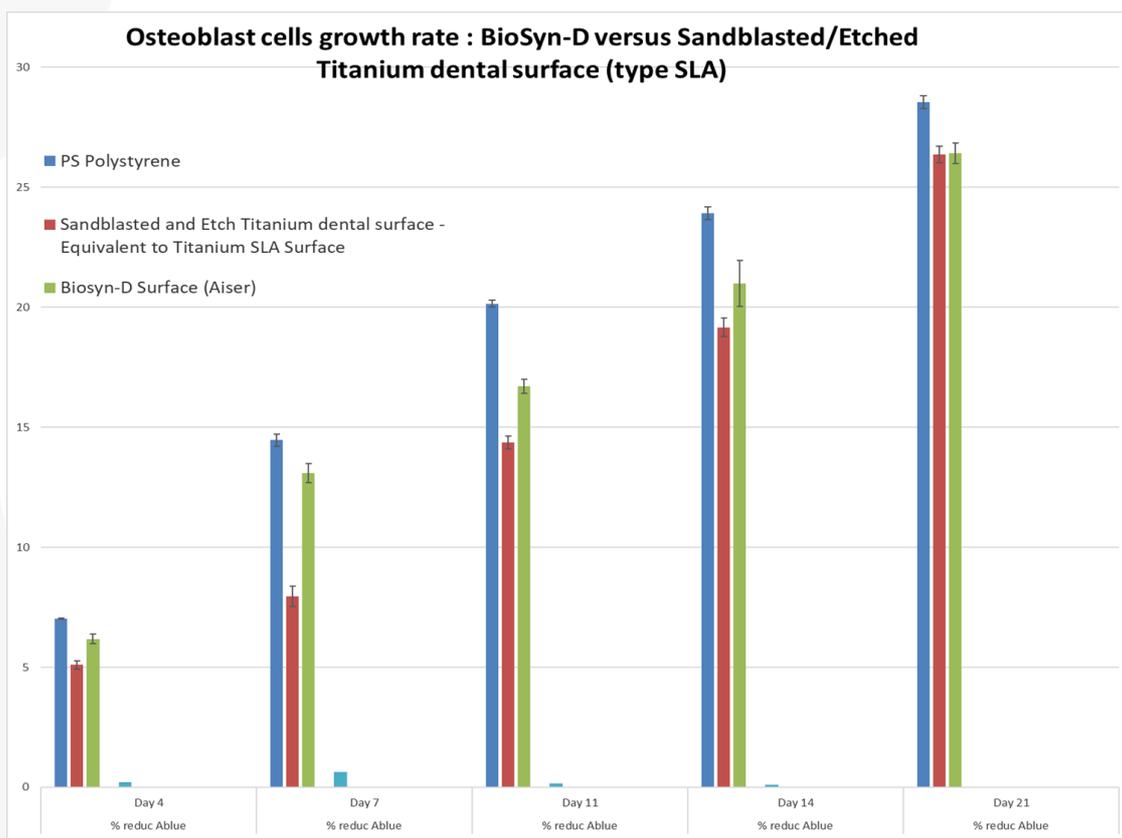
SURFACE ROUGHNESS AND SURFACE TOPOGRAPHY



3D surface reconstruction and Surface roughness profile (R) was measured using a high-resolution, white light, non-contact laser profilometer (CyberSCAN CT 100, Cyber technologies, Eching-Dietersheim, Germany) with a z-resolution of 20 nm and a lateral resolution of 1 μm.

Surface roughness parameters were calculated using a Gaussian profile filter with the cut-off wavelength (λ_c) set to 0.8 mm and the sampling length set to 4 mm, with a total scanning length of 5.6 mm as per specifications by the International Standards Organization (ISO 11,562).

Biosyn-D biological surface characterization



Cell culture

Proliferation assay: HOS cells were cultured on a Titanium SLA surface Ti-SLA and AISER Biosyn-D® implant surface at a density of 2600 cells cm².

Cells were cultured for 21 days in triplicate (n=6). Within each run, Resazurin assays and RNA extractions were performed on days 2–3, 7, 14 and 21. Cultures on polystyrene were used as a positive control.

Resazurin assay

Resazurin (Sigma-Aldrich, USA) was added to the culture media at a concentration of 0.01 mg ml⁻¹ after which the cells were maintained at 37 °C/5% CO₂ for 4 h. The supernatants were removed, and their absorbance was measured at 570 nm on an ELISA plate reader (background OD 630 nm).

Biosyn-D biological surface characterization

Osteoblast HOS cell growth rate was measured on AISER BioSyn-D® implant surface and was compared with a gold-standard sandblasted and double acid-etched titanium dental surface (SLA).

- Both Surfaces are found to be **biocompatible**. HOS cells proliferate well as expected for Titanium dental implant surfaces.
- AISER Biosyn-D surface exhibits **higher performances** in HOS cells growth rate than regular Titanium SLA like surface:

 At day 4 : 21.3% increase

 At day 7 : 64.5% increase

Biosyn-D surface exhibits excellent **biocompatibility performances** which lead to **higher HOS cell growth rates** than regular sandblasted and double acid-etched titanium dental surfaces.

With such an increase in proliferation growth rates, AISER **Biosyn-D** surface could probably **decrease the healing time needed before loading an implant** in the course of standard implantation procedures.

These preliminary results will be completed by ongoing in-vitro study and planned future animal studies.

NOTE: THE RELATIVE GROWTH RATE DECREASE ON BIOSYN-D VERSUS TISLA SURFACE, AFTER DAY 7, IS LIKELY DUE TO THE LIMITED SURFACE AREA OF THE SAMPLE USED TO PERFORM THE PROLIFERATION STUDY.

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