

## Abstract

# Aluminum in Dental Implants: How to Reduce a Potential Risk to Patient's Health? <sup>†</sup>

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<sup>†</sup> Presented at the First Corrosion and Materials Degradation Web Conference, 17–19 May 2021; Available online: <https://cmdwc2021.sciforum.net/>.

**Abstract:** Some commercial dental implants contain aluminum, which represents a potential risk to health, since aluminum is associated with neurodegenerative diseases such as Alzheimer's disease. Therefore, control of the chemical composition as well as the surface characteristics of implants is necessary, and one approach is functionalization of the implant's surface by bio(organic) molecules. Hydrolyzed collagen molecules were self-assembled on the titanium implant containing aluminum. Density Functional Theory calculation results indicated an exergonic reaction ( $\Delta G^*_{\text{INT}} = -6.45 \text{ kcal mol}^{-1}$ ) between the implant surface and the chosen hydrolyzed collagen molecules, while electrochemical impedance spectroscopy results pointed to improved anti-corrosion properties of the modified implant surface (protective effectiveness,  $\eta = 98.5\%$ ) compared to the unmodified implant surface. During immersion in an artificial saliva (7 days), the hydrolyzed collagen-modified implant remained stable, which is crucial for minimizing the possible negative biological effects on patient's health.

**Keywords:** titanium dental implant; aluminum; surface functionalization; EIS; DFT; anti-corrosion properties



**Citation:** Petrović, Ž.; Šarić, A.; Despotović, I.; Katić, J.; Petković, M. Aluminum in Dental Implants: How to Reduce a Potential Risk to Patient's Health? *Mater. Proc.* **2021**, *6*, 12. <https://doi.org/10.3390/CMDWC2021-09933>

Academic Editor: Cuie Wen

Published: 8 May 2021

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**Supplementary Materials:** The poster is available at <https://www.mdpi.com/article/10.3390/CMDWC2021-09933/s1>.

**Institutional Review Board Statement:** Not applicable.

**Informed Consent Statement:** Not applicable.

**Data Availability Statement:** The data presented in this study are available on request from the corresponding author.