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***In-situ* formation of textured TiN coatings on biomedical titanium alloy  
by laser irradiation**

Xueyang Zhao, Peng Zhang, Xiaojian Wang\*, Yun Chen, Hui Liu, Lianxi Chen, Yinying Sheng,  
and Wei Li\*

Institute of Advanced Wear & Corrosion Resistance and Functional Materials, Jinan University,  
No. 601 Huangpu Avenue West, Guangzhou, China, 510632

\* Corresponding author E-mail address: xiaojian.wang@jnu.edu.cn (Xiaojian Wang);  
liweijnu@126.com (Wei Li)

**ABSTRACT:**

The Ti-35Nb-7Zr-5Ta (TNZT) alloy has received much research attention among the biomedical titanium alloys for its low Young's modulus and outstanding biocompatibility. This paper provided an innovative technique for improving the wear and corrosion resistance of the TNZT alloy, by developing *in-situ* formed TiN coatings on the surface of the TNZT alloy through laser irradiation. The new technique combines the advantages of laser surface texturing and laser gas alloying. The experimental results showed that the phase compositions of the textured TNZT samples were  $\beta$ -Ti, martensitic  $\alpha''$  phase and TiN after laser texturing in  $N_2$ . The diameter of the surface dimples increased, when the width of laser pulse increased from 0.3 ms to 0.7 ms, and the depth decreased accordingly. In comparison to the samples without treatment, both the wear rate and the frictional coefficient of the TNZT samples with textured TiN coatings decreased significantly. The surface dimples served as micro-hydrodynamic bearing, which were able to keep liquid inside. As a result, the sample with a width of pulse of 0.3 ms treated in  $N_2$  exhibited the lowest wear rate of  $0.025 \times 10^{-2} \text{ m}^3/\text{N}\cdot\text{m}$ , while the value of the sample without treatment was

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