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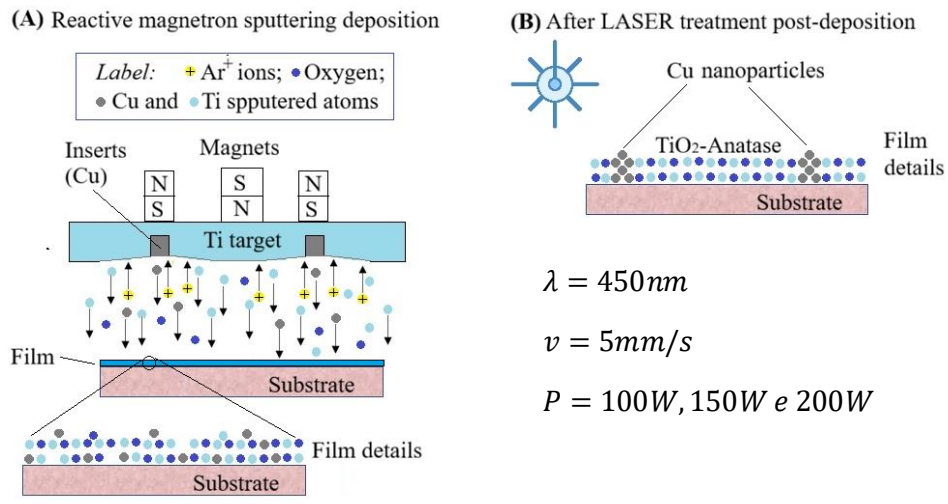
Effect of laser heat treatment on Cu nanoparticle precipitation and wettability of TiO_2 and TiO_2[Cu] thin films

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Introduction

Austenitic steel, used in the food industry, is subject to the accumulation of organic residues and bacterial adhesion [1], which reduces the effectiveness of conventional cleaning methods. Considering that TiO2 films doped with Cu have biocidal and self-cleaning properties [2], coating these steels with thin films becomes an excellent solution. In this work, a laser heat treatment for ultrafast and localized heating of TiO2[Cu] films to precisely modify the topography and wettability of the film was studied.

Experimental Procedure



$\lambda = 450nm$

$v = 5mm/s$

$P = 100W, 150W\ e\ 200W$

Figure1: Schematic representation of the experimental procedure

Characterizations: X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM), and contact angle measurements.

Results and Discussion

SEM:

- Continuous matrix, but with particle precipitation on the surface from LT 20 J/mm.

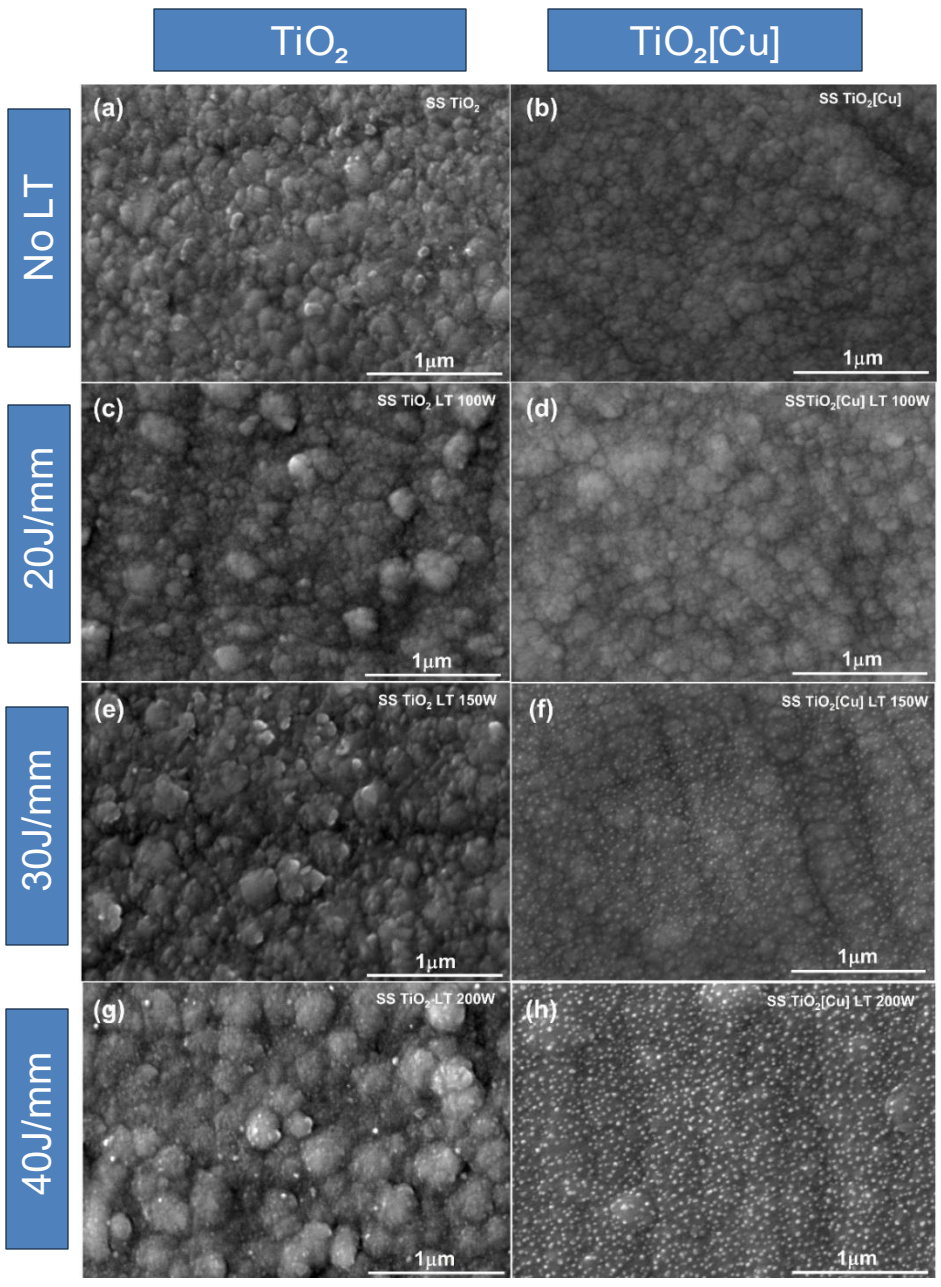


Figure 2: Top-view FEG-SEM micrographs of coatings before and after laser treatment

XRD:

- XRD diagrams confirmed the coexistence of the anatase crystalline phase.

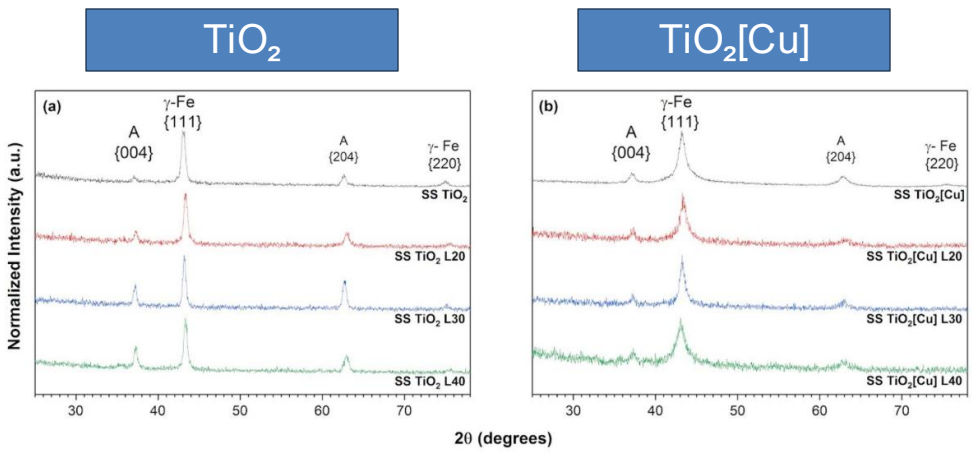


Figure 3: GIXRD patterns of the prepared samples and their respective laser treatment post

Contact Angle:

- There is difference between TiO2 and TiO2[Cu];
- Modification of the hydrophilicity regime with LT.

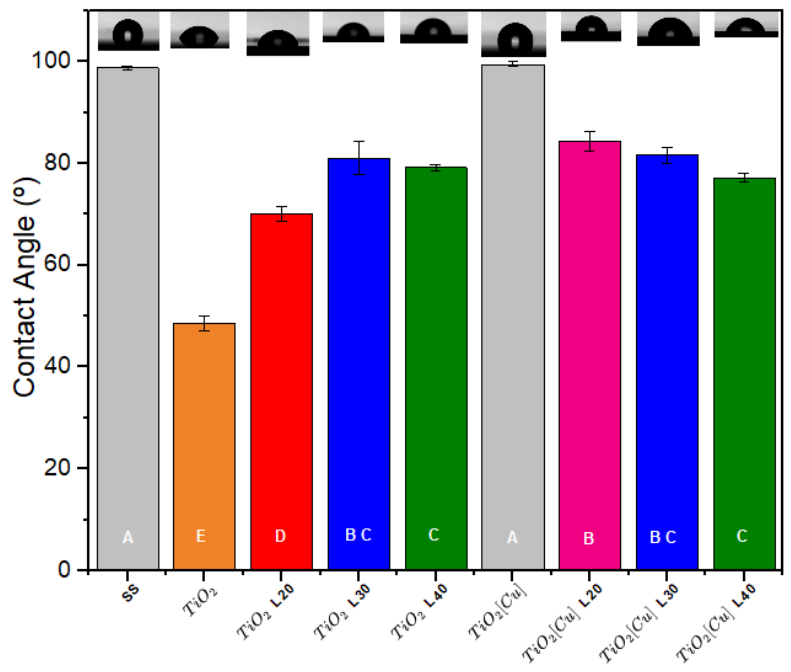


Figure 4: Contact angle for all samples.

Conclusions

Overall, these results show that blue laser irradiation serves as an effective post-processing strategy for generating Cu-rich surface nanoparticles while maintaining the integrity of the anatase TiO_2 matrix.

References

[1] PADMANABHAN and JOHN, 2020.
[2] BANERFEE, DIONYSIOU and PILLAI, Applied Catalysis B: Environmental, 2015.

Acknowledgments

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