Electronic Supplementary Material (ESI) for RSC Advances.

Supplementary Material for:

Conical Microstructuring of Titanium by Reactive Gas Assisted Laser Texturing

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Content

1. Laser parameters

Table ST1 All laser parameters used in this work.

parameter set	**1**	**2**	**3**	**4**
laser	Ti-sapphire	Ti-sapphire	Amphos 400	Amphos 400
material	Ti	Al	Ti	Al
wavelength	800 nm	800 nm	1030 nm	1030 nm
pulse width	60 fs	60 fs	0.75 ps	0.75 ps
spot diameter	140 µm	100 µm	140 µm	100 µm
speed	5.6 mm/s	4 mm/s	560 mm/s	400 mm/s
repetition rate	10 kHz	10 kHz	1 MHz	1 MHz
***E* (pulse)**	2.22E-04 J	2.05E-04 J	2.22E-04 J	2.05E-04 J
fluence (*J*)	1.44 J/cm²	2.61 J/cm²	1.44 J/cm²	2.61 J/cm²
pulse per spot	250	250	250	250
line distance	60 µm	100 µm	60 µm	100 µm
atmosphere	N2	N2	air/N2	N2/air
image	Fig. 1g	Fig. 1a	Fig. 1h	Fig. 1b/Fig. 1c

parameter set	**5**	**6**	**7**	**8**
laser	Amphos 400	**Amphos 400**	Trotec	Trotec
material	Al	**Ti**	Al	Al
wavelength	1030 nm	**1030 nm**	1064 nm	1064 nm
pulse width	0.75 ps	**0.75 ps**	approx. 2 ns	approx. 2 ns
spot diameter	97 µm	**95 µm**	100 µm	100 µm
speed	50 mm/s	**100 mm/s**	100 mm/s	100 mm/s
repetition rate	1 MHz	**1 MHz**	80 kHz	20 kHz
***E* (pulse)**	1.10E-05 J	**9.75E-06 J**	2.50E-04 J	1.00E-03 J
fluence (*J*)	0.15 J/cm²	**0.14 J/cm²**	3.18 J/cm²	12.73 J/cm²
pulse per spot	1960	**942**	80	20
line distance	13 µm	**7 µm**	120 µm	120 µm
atmosphere	air	**air/N2/ various**	air	air
image	Fig. 1d	**Fig. 1i/Fig. S1/Fig. 4-6/ Fig. S2-S4**	Fig. 1e	Fig. 1f

2. Additional scanning electron microscopy (SEM) images

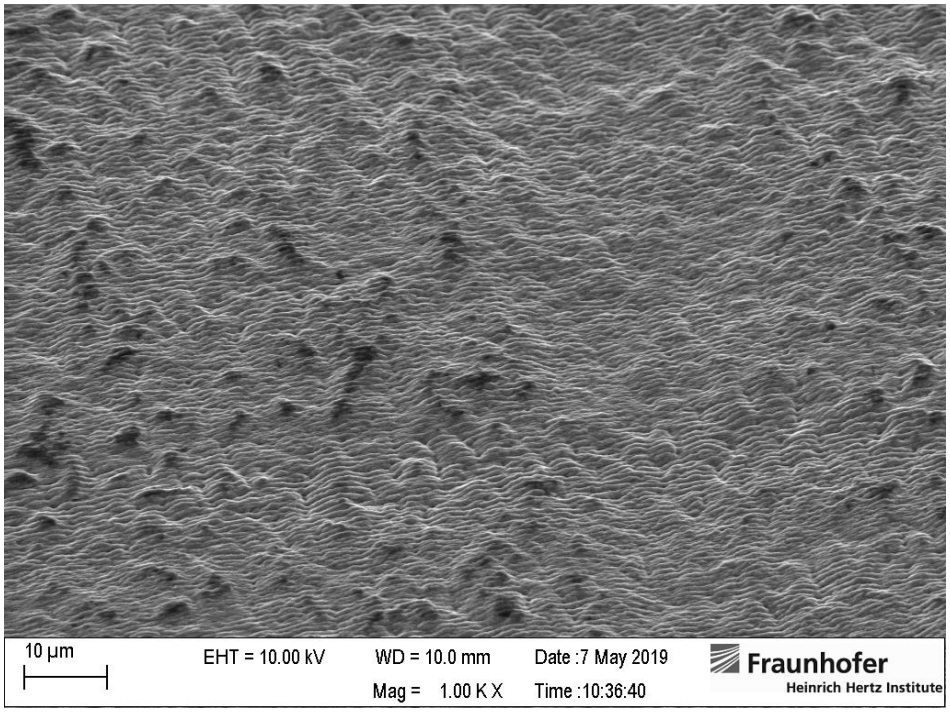

Fig. S1. SEM image of titanium surface treated with 0.75 ps laser pulses (see main text and Table ST1, parameter set 6 for laser parameters) under a nitrogen atmosphere.

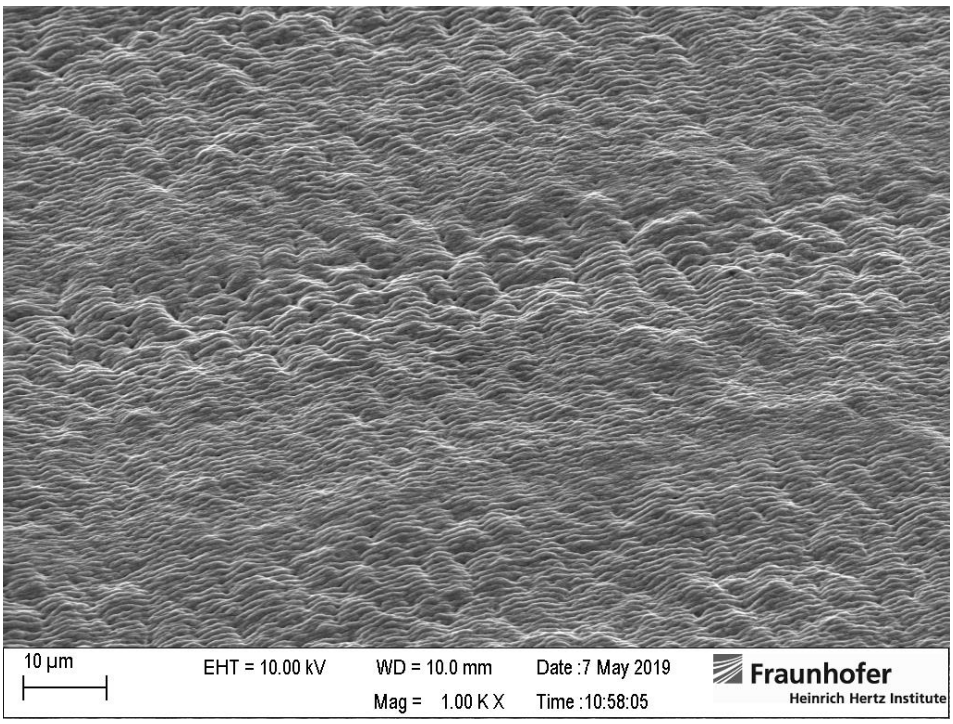

Fig. S2. SEM image of titanium surface treated with 0.75 ps laser pulses (see main text and Table ST1, parameter set 6 for laser parameters) under a nitrogen atmosphere in presence of iodine.

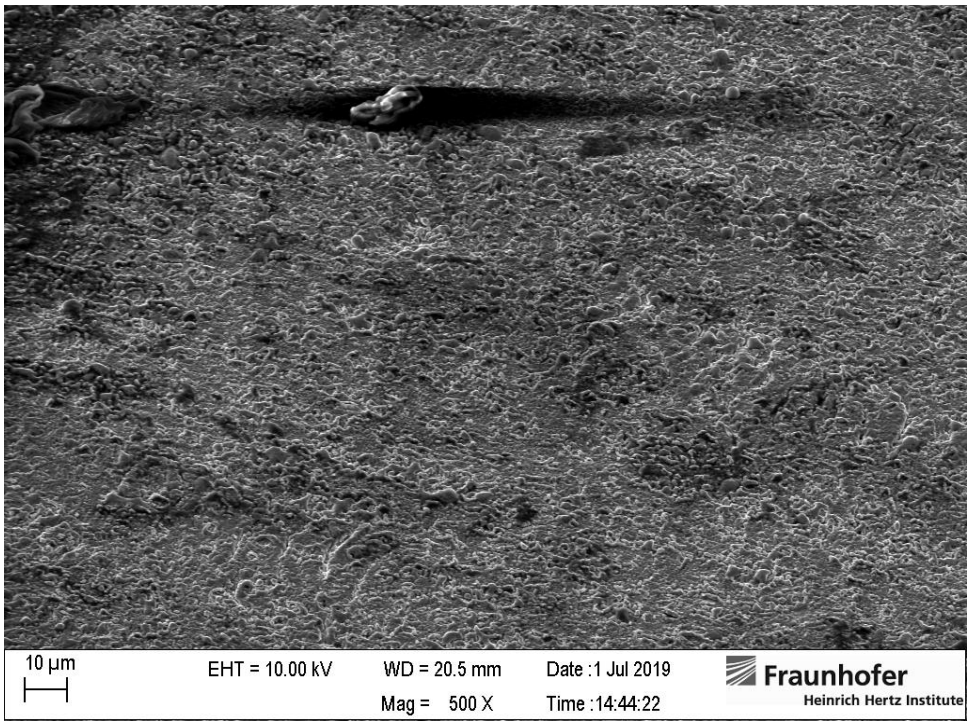

Fig. S3. SEM image of pure titanium surface treated with 0.75 laser ps pulses (see main text and Table ST1, parameter set 6 for laser parameters) in chloroform/air atmosphere.

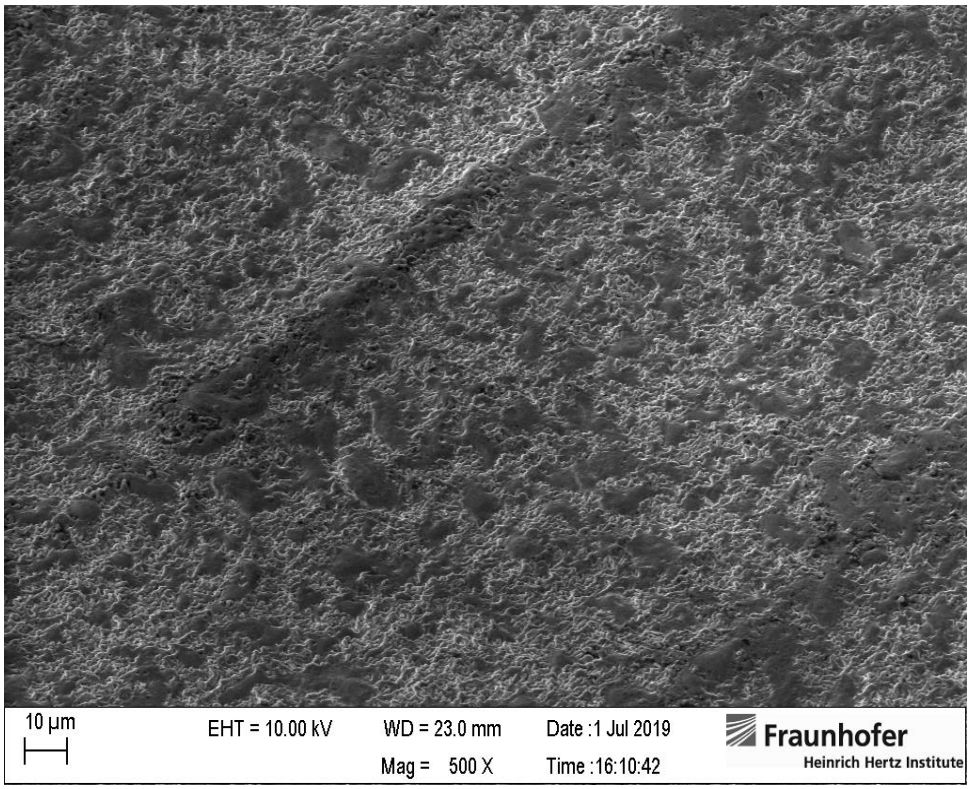

Fig. S4. SEM image .of Ti-6Al-4V surface treated with 0.75 laser ps pulses (see main text and Table ST1, parameter set 6 for laser parameters) in chloroform/air atmosphere.

3. Additional UV/Vis spectra

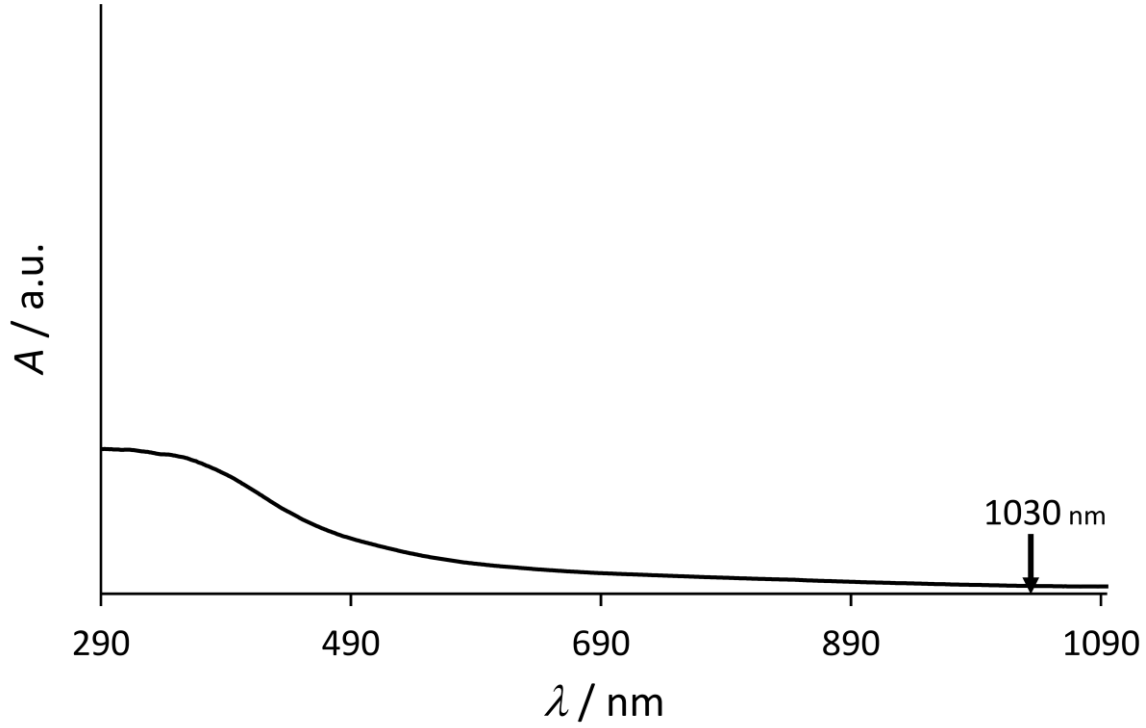

Fig. S5. UV/Vis/NIR spectrum of chloroform gas.

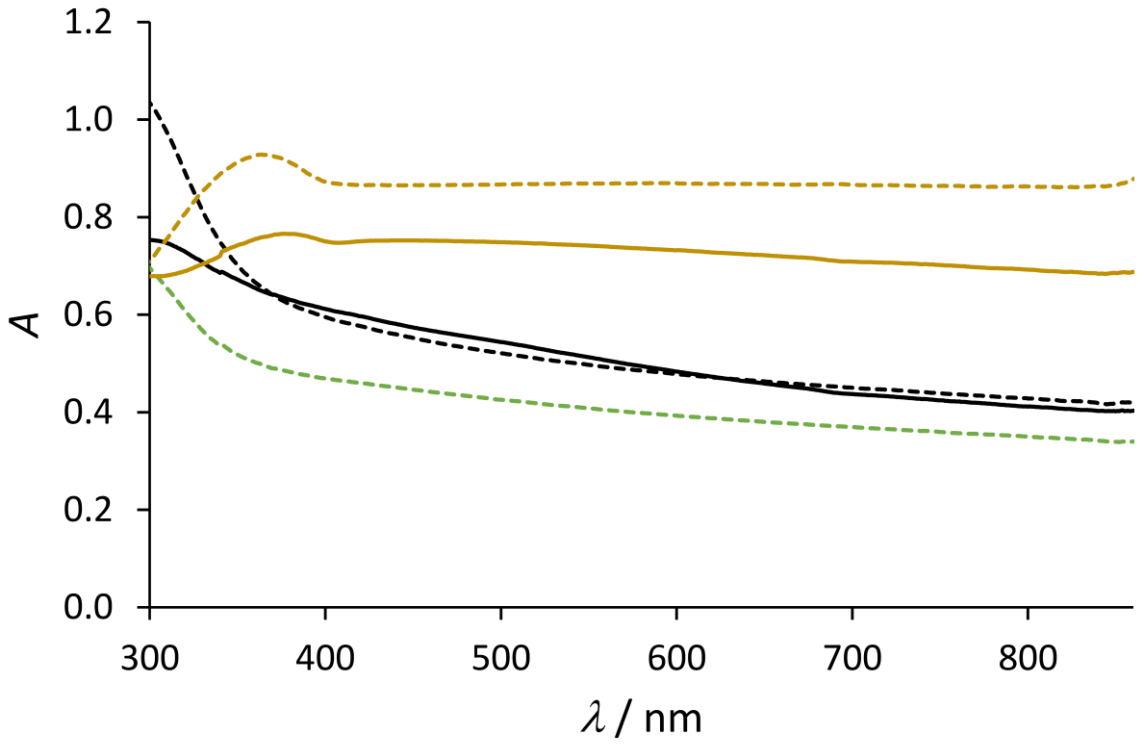

Fig. S6. Reflective UV/Vis spectra of pure titanium (solid lines) and Ti-6Al-4V (dashed lines) untreated (black) and processed with 0.75 ps laser pulses in chlorine/air (green) and chloroform/air (beige) atmosphere.

4. Additional photographic images

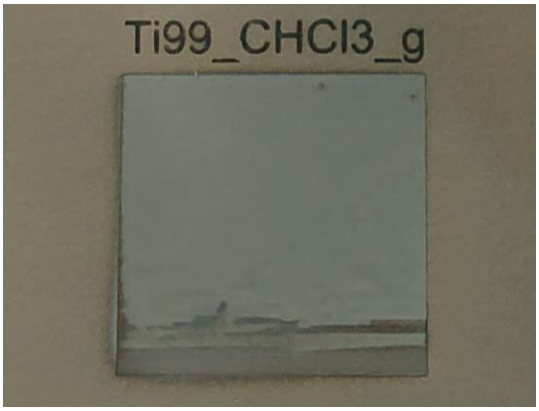

Fig. S7. Photographic image of pure titanium plate treated with 0.75 ps laser pulses in chloroform/air atmosphere.

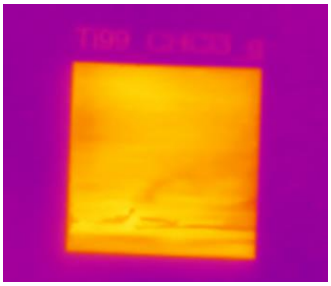

Fig. S8. Infrared (emissivity) image of pure titanium plate at 100 °C treated with 0.75 ps laser pulses in chloroform/air atmosphere.