

A multi-physic modelling insight into the differences between microwave and conventional heating for the synthesis of TiO₂ nanoparticles

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Table S1: |S11| parameter [dB] values calculated at the operating frequency of 2.45 [GHz] as function of the radius [mm] of the inner circumference of the hexagonal applicator. Optimized conditions indicated in yellow colour.

Radius (R) [mm]	S11 [dB] at 2.45 [GHz]
90	-13.27
92	-13.48
94	-18.6
96	-24.09
98	-16.85
100	-13.23
102	-10.79
104	-10.15
106	-13.034
108	-24.37
108.2	-26.49
108.4	-30.22
108.6	-35.4
108.8	-37.62
109	-35.08
109.2	-30.76
109.4	-27.74
109.6	-25.62
109.8	-23.61
110	-21.69
112	-13.3
114	-9.178
116	-8.305
118	-7.969
120	-9.252

Figure S1: Variation of the simulated reflection coefficient $|S_{11}|$ [dB] with frequency [Hz] in the optimized conditions (inner diameter of the hexagonal applicator: radius=108.8 mm) and measured reflection coefficient.

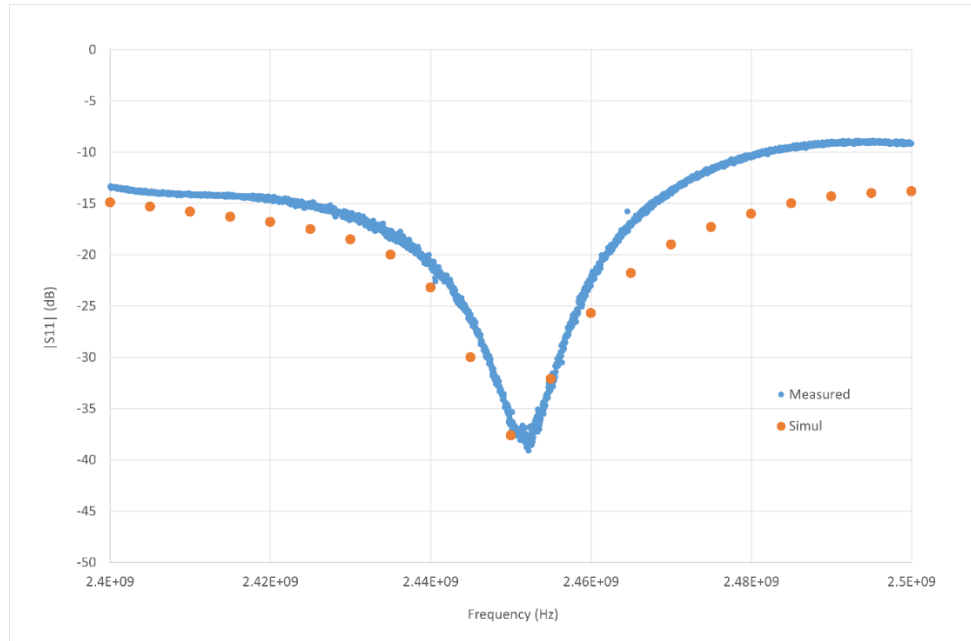


Table S2: Temperature Homogeneity Index (THI) as function of the height of the load inside the helix: conventional heating and microwave heating, front of the helix with respect to the waveguide.

Height of the load inside the helix [mm]	Temperature Homogeneity Index (THI)	
	Conventional Heating	Microwave Heating
55	19.95266	17988.7
75	23.05895	55195.28
95	25.92137	18528.9
115	28.35415	18043.48
135	31.30619	17966.66
155	35.1676	22177.95
175	39.52196	38812.39
195	42.89888	29935.27
215	47.0405	20911.05
235	54.34064	33275.81
255	58.96768	13406.27
275	65.18053	11040.19
295	71.94423	17670.77
315	79.48844	29637.81
335	89.16447	9235.645
355	97.41626	5655.837
375	107.1959	5734.938
395	118.1722	11406.72
415	129.3962	13213.47
435	141.5953	34589.1

Table S3: Temperature Homogeneity Index (THI) as function of the height of the load inside the helix: conventional heating and microwave heating, rear of the helix with respect to the waveguide.

Height of the load inside the helix [mm]	Temperature Homogeneity Index (THI)	
	Conventional Heating	Microwave Heating
65	22.17781	22901.94
85	24.23259	11709.38
105	26.7195	40981.36
125	29.39933	58763.78
145	33.32272	81724.79
165	37.39	23233.51
185	40.97518	11518.78
205	44.46606	5546.474
225	51.55685	6437.445
245	56.5626	8586.807
265	62.65331	29369.97
285	67.63764	12031.57
305	76.87718	8921.481
325	83.73064	21277.26
345	93.03465	26150.63
365	98.8488	11617.03
385	113.4809	10547.1
405	123.4475	14068.46
425	139.4759	8530.886
445	150.0994	8713.088

Figure S2: Average temperatures and heating rates of the load along the applicator height in the rear of the helix with respect to the waveguide, in case of conventional and microwave heating.

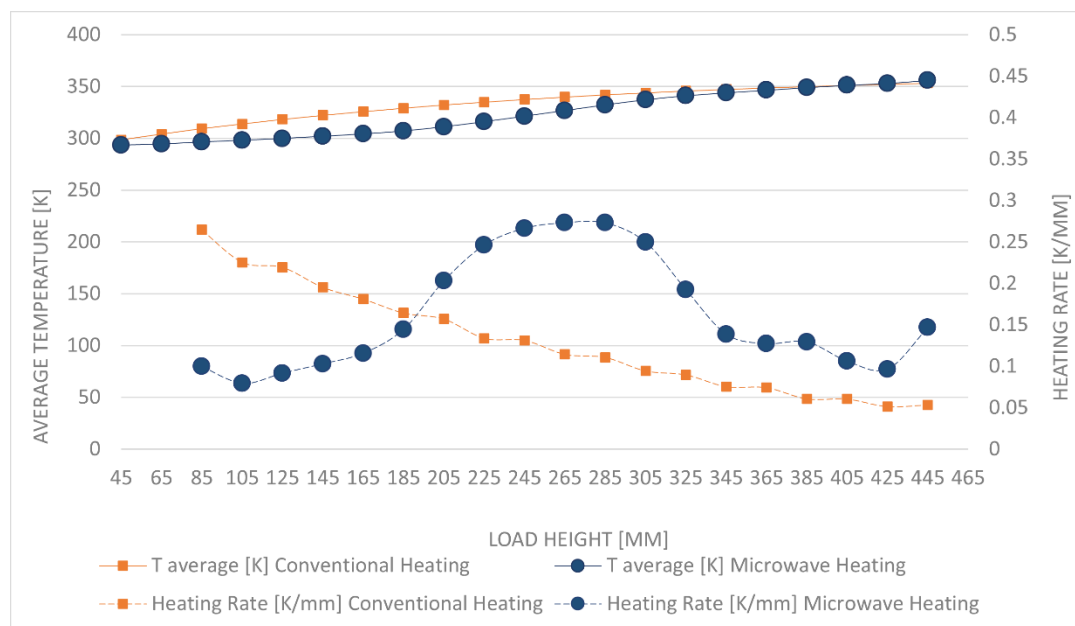


Table S4: Values of average temperatures and heating rates of the load along the applicator height in the front of the helix with respect to the waveguide, in case of conventional and microwave heating.

Load Height [mm]	T average [K]		Heating Rate [K/mm]	
	Conventional Heating	Microwave Heating	Conventional Heating	Microwave Heating
35	301.7430976	293.4211452		
55	306.7893001	295.4420953	0.154654879	0.001057262
75	311.5830925	297.1360993	0.252310126	0.1010475
95	316.0199402	298.8901969	0.239689622	0.0847002
115	320.2614504	300.8393047	0.221842381	0.087704884
135	324.0227505	303.0021903	0.212075513	0.097455388
155	327.4749148	305.5885303	0.188065001	0.10814428
175	330.664579	309.0934	0.172608218	0.129317
195	333.6488746	313.6609812	0.159483208	0.175243484
215	336.2283976	318.788614	0.149214783	0.22837906
235	338.7646095	324.1144588	0.128976145	0.256381639
255	340.9791394	329.5094531	0.126810596	0.266292242
275	343.0497516	334.7700179	0.110726495	0.269749712
295	344.8997912	339.2212411	0.103530611	0.263028241
315	346.4671509	342.5297275	0.092501979	0.222561159
335	347.9793519	345.1767801	0.078367988	0.16542432
355	349.3204934	347.7784363	0.075610047	0.132352633
375	350.5784345	350.2274205	0.067057075	0.130082808
395	351.6984537	352.193952	0.062897057	0.12244921
415	352.7732201	354.53681	0.056000959	0.098326577
435	301.7430976	293.4211452	0.053738317	0.117142897

Table S5: Values of average temperatures and heating rates of the load along the applicator height in the rear of the helix with respect to the waveguide, in case of conventional and microwave heating.

Load Height [mm]	T average [K]		Heating Rate [K/mm]	
	Conventional Heating	Microwave Heating	Conventional Heating	Microwave Heating
45	298.65	293.40		
65	304.1031985	294.3874226	0.272659924	0.049371132
85	309.3978835	296.3846628	0.264734251	0.099862009
105	313.9064623	297.9694161	0.22542894	0.079237664
125	318.294207	299.8015621	0.219387235	0.091607303
145	322.198117	301.8595234	0.195195502	0.102898062
165	325.8201102	304.171955	0.181099658	0.115621578
185	329.1058359	307.0643433	0.164286287	0.144619415
205	332.2473516	311.1257003	0.157075782	0.203067853
225	334.9238676	316.0526281	0.1338258	0.246346389
245	337.551604	321.3830567	0.131386819	0.266521429
265	339.8406739	326.8484426	0.114453497	0.273269294
285	342.0565458	332.3086114	0.110793596	0.273008444
305	343.9458149	337.3034162	0.094463454	0.249740236
325	345.7412046	341.1529025	0.089769482	0.192474318
345	347.2525001	343.9258286	0.075564775	0.138646307
365	348.7387829	346.4706925	0.07431414	0.127243192
385	349.9541396	349.0582913	0.060767838	0.129379942
405	351.1638148	351.1791544	0.060483761	0.106043152
425	352.1938802	353.109087	0.051503267	0.096496635
445	353.2636814	356.0408486	0.053490062	0.146588078

Figure S3: Electric field strength in the applicator, slice plot, showing the higher electric field strength in the central regions of the applicator.

