



# Inconel 718

## R&D Report

**Report ID:** RD/RM/1005

**Purpose:** Marketing

**Material:** Inconel 718

**Date:** 18.06.2019

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**Checked by:** Marcin Trzciński

## Introduction

The goal of this report is a short summary of Inconel 718 atomization status for marketing purposes.

There were multiple test performed on Inconel 718. The atomized material was in the form of a wire  $\varnothing$  1,2 mm.

Report contains microscopic analysis of the distribution, circularity, oxygen/nitrogen level, chemical composition and photos of the particles.

## Average test results

Table 1 Basic average values

	Diameter [ $\mu$ m]	Circularity
Average	47,31	0,98
Standard deviation	11,51	0,09
Max	110,63	1
Min	0	0,53

Figure 1 Photo of the material x100

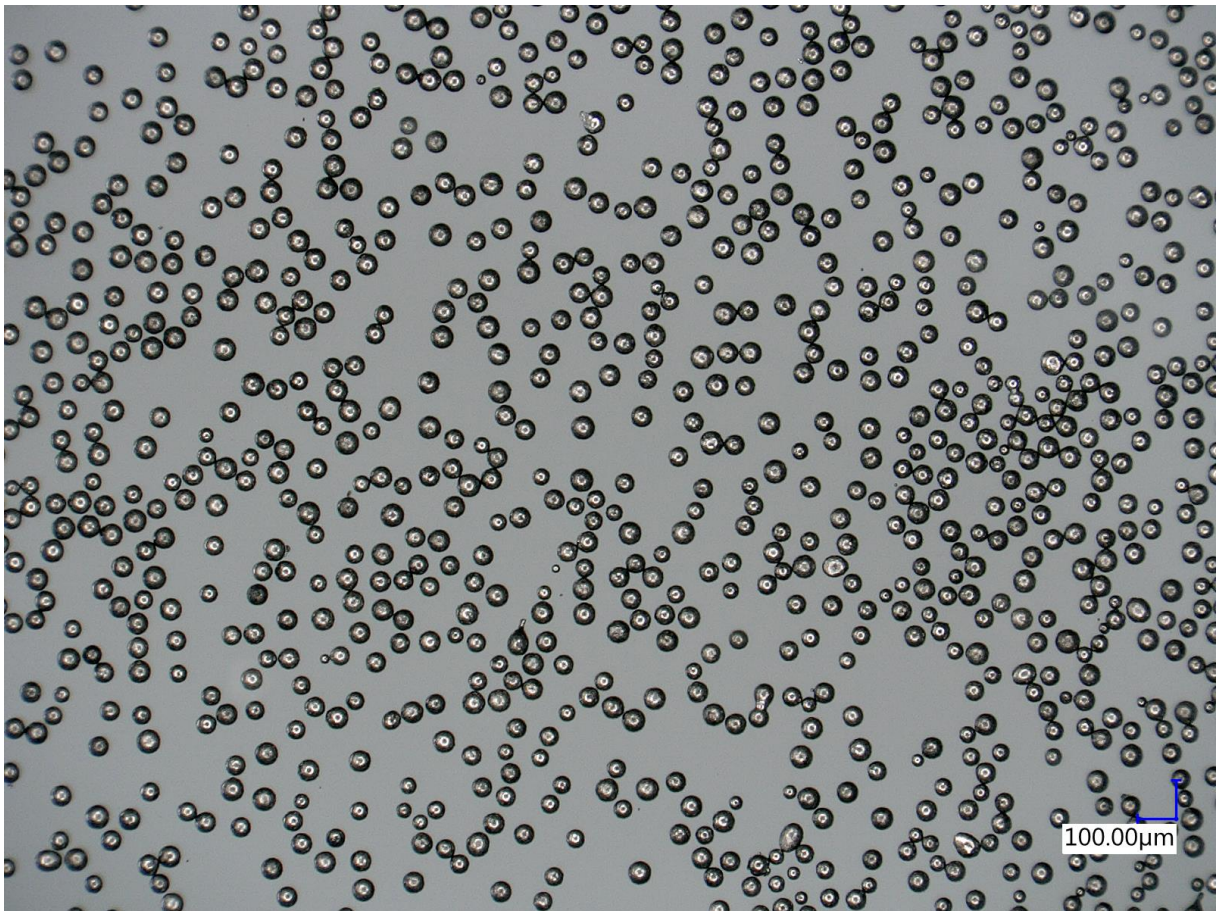
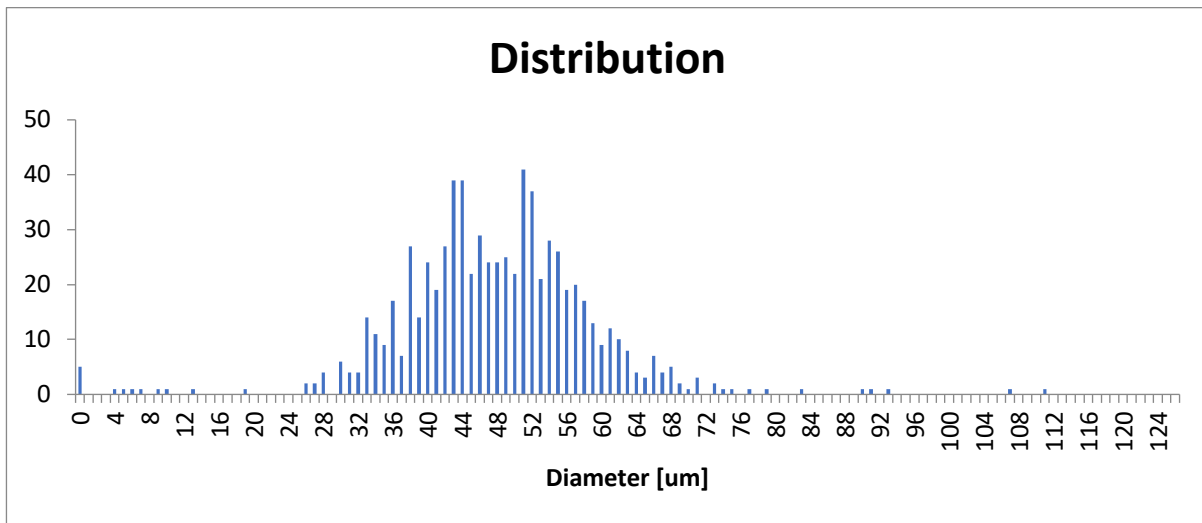


Figure 2 Histogram of the particle size distribution



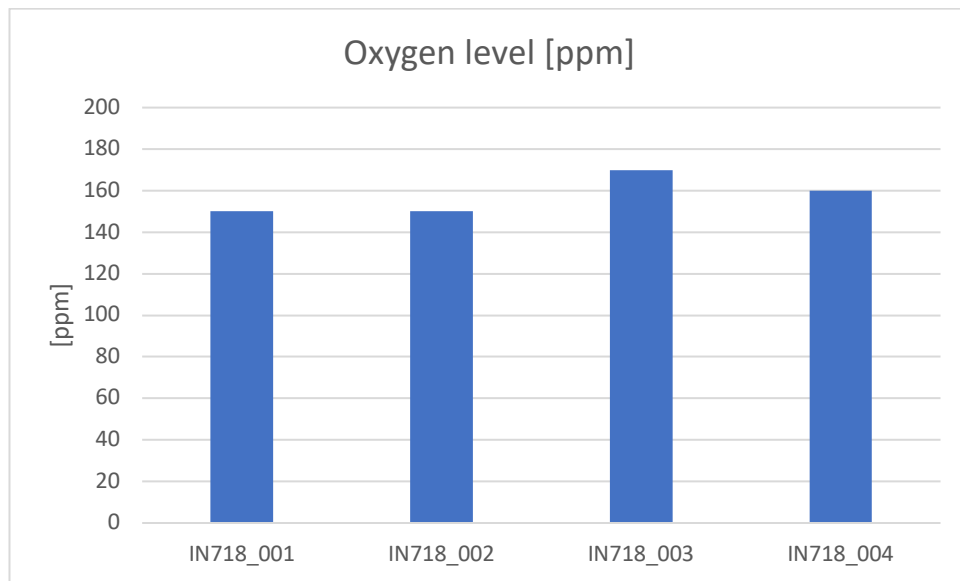
## Oxygen level

Oxygen level have been tested in a certified laboratory. The results are shown below.

Table 2 Oxygen level in the samples

Sample	Test results [%]	U <sub>B</sub>	Test methods
IN718_001	0.015	0.002	<i>LECO methodology</i>
IN718_002	0.015	0.002	
IN718_003	0.017	0.002	
IN718_004	0.016	0.002	

Figure 3 Oxygen level in the samples



## SEM photography

Figure 4 SEM photo of the particles (x300)

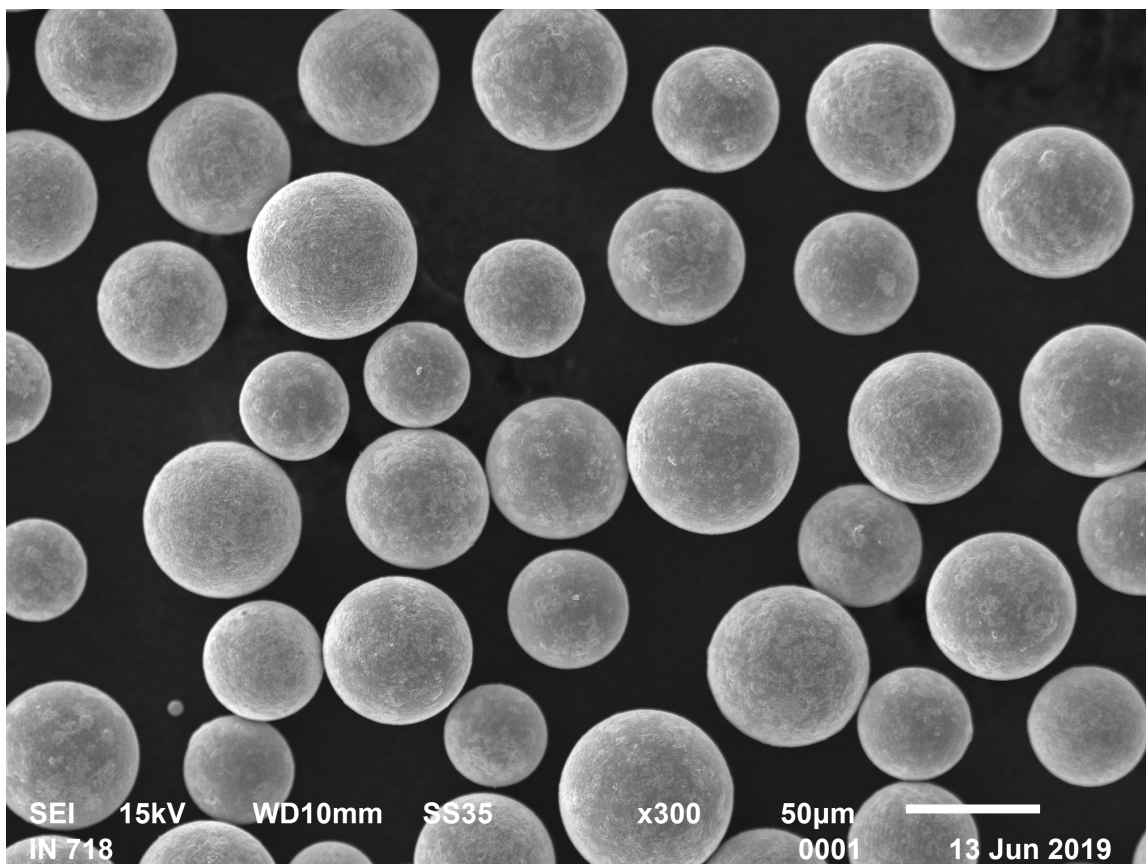
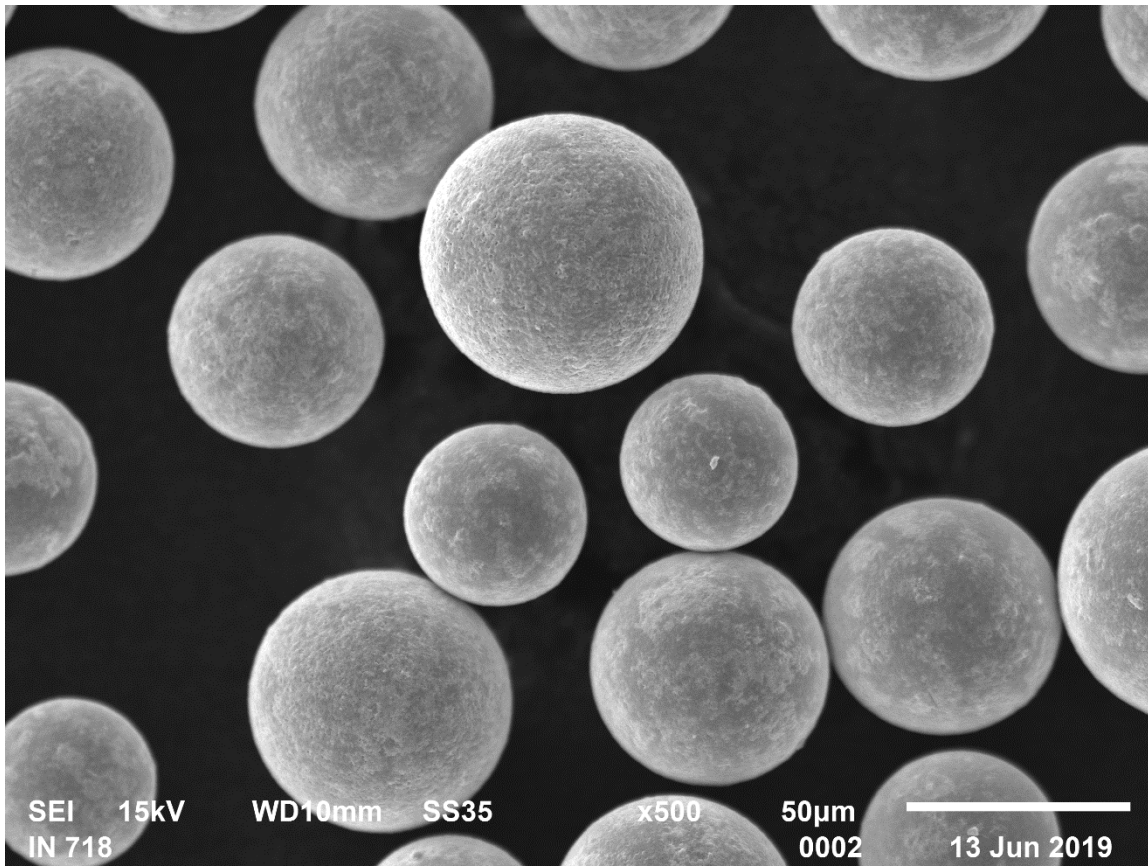


Figure 5 SEM photo of the particles (x500)



# Chemical composition

The chemical composition was checked in certified laboratory. Test were performed by ICP-OES method.

Table 3 Chemical composition of nickel powder and nickel wire #

Requirements for Inconel 718 grade [%]		IN 718 Powder	$U_B^{(1)}$	IN718 Wire	$U_B^{(1)}$	Test methods
		Test results [%]				
C	≤ 0.08	0.045	0.001	0.063	0.002	PN-EN ISO 15350:2010
Mn	≤ 0.35	0.015	0.001	0.029	0.001	BOSMAL/I-7-43/06
Si	≤ 0.35	0.070	0.004	0.074	0.004	
P	≤ 0.015	< 0.01	-	< 0.01	-	
S	≤ 0.015	< 0.005	-	< 0.005	-	PN-EN ISO 15350:2010
Cr	17.0 ... 21.0	17.1	0.3	17.2	0.3	BOSMAL/I-7-43/06
Mo	2.8 ... 3.3	3.0	0.2	2.9	0.2	BOSMAL/I-7-43/06
Ni	50.0 ... 55.0	50.3	2.0	50.4	2.0	
Co	≤ 1.0	0.028	0.001	0.028	0.001	
Al	0.20 ... 0.80	0.52	0.03	0.52	0.03	
Cu	≤ 0.30	0.057	0.003	0.056	0.003	
Nb	4.7 ... 5.5	5.4	0.3	5.3	0.3	
Ta <sup>(2)</sup>	≤ 0.05	-	-	-	-	
Ti	0.65 ... 1.15	0.96	0.05	0.94	0.05	
B	≤ 0.006	0.0026	0.0002	0.0026	0.0002	
W	-	< 0.01	-	< 0.01	-	
O	-	0.015	0.005	0.0051	0.0005	
Fe	balance	balance	-	balance	-	-

<sup>(1)</sup>  $U_B$  – total expanded uncertainty of category B (confidence level 0.95)

<sup>(2)</sup> Ta was not analyzed

## Overall Conclusion

For Inconel 718 average measure diameter is 47,31  $\mu\text{m}$ . Particles have good sphericity without any defects. No contaminations were observed among powder particles. Light oxidation was observed on some particles. Average oxygen level was measured at 155ppm. ICP-OES examination shows that there is no contamination in chemical composition. Process of atomization of Inconel 718 was very stable and predictable. Process efficiency oscillated around 94%