

METALLIC POWDER MANUFACTURE FOR CONDITIONING CAST IRON AS AN AM SUBSTRATE

O. Barrenetxea¹, X. Lasheras¹, R. González-Martínez¹, S. Wielowieyski², G. Artola¹, A.I. Fernández-Calvo¹

¹AZTERLAN, Basque Research and Technology Alliance (BRTA), Aliendalde Auzunea 6, 48200, Durango, Spain

²3D Lab Sp. Z o. o., Farbiarska 63B, 02-862 Warszawa, Poland

SCOPE

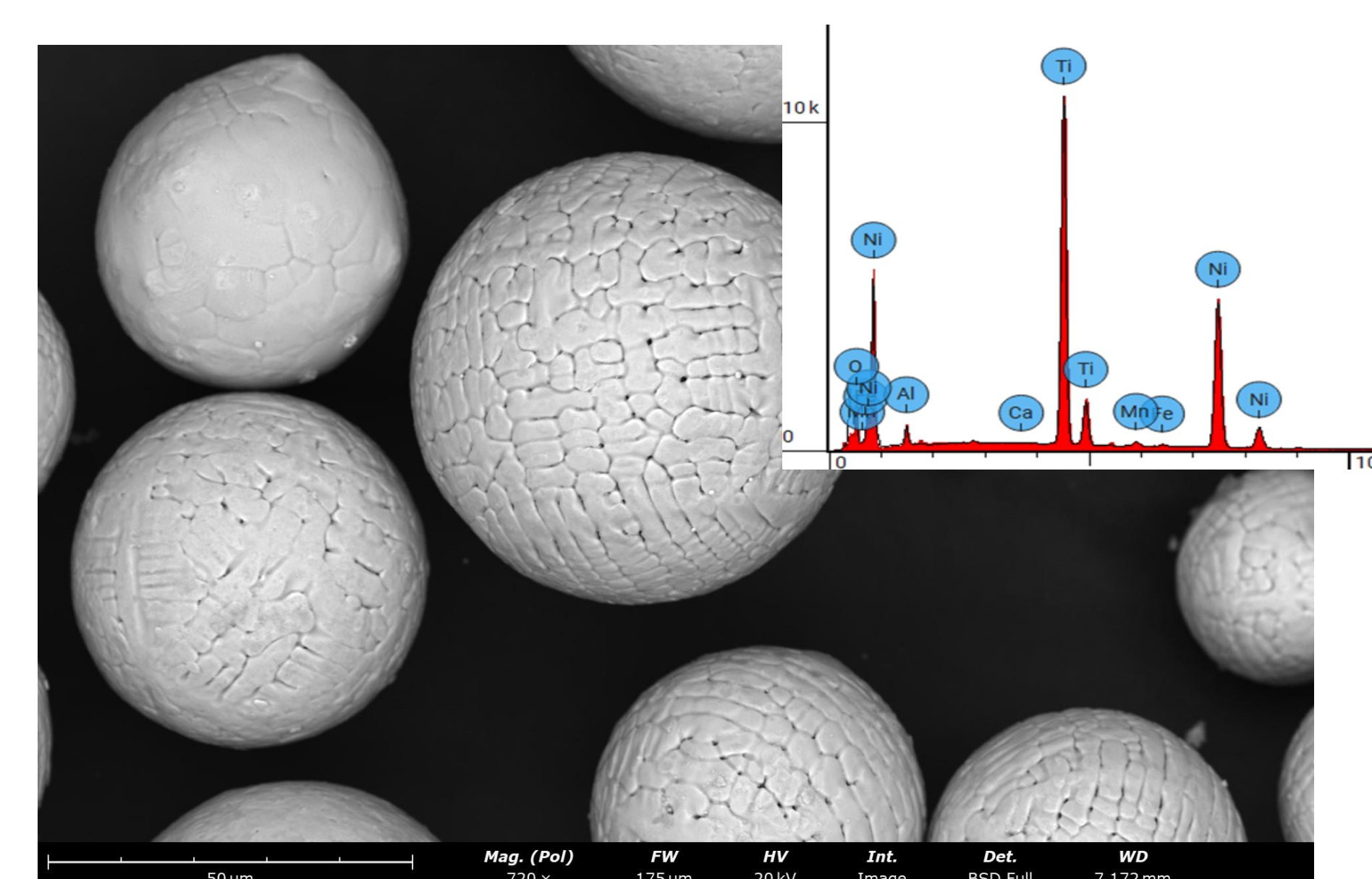
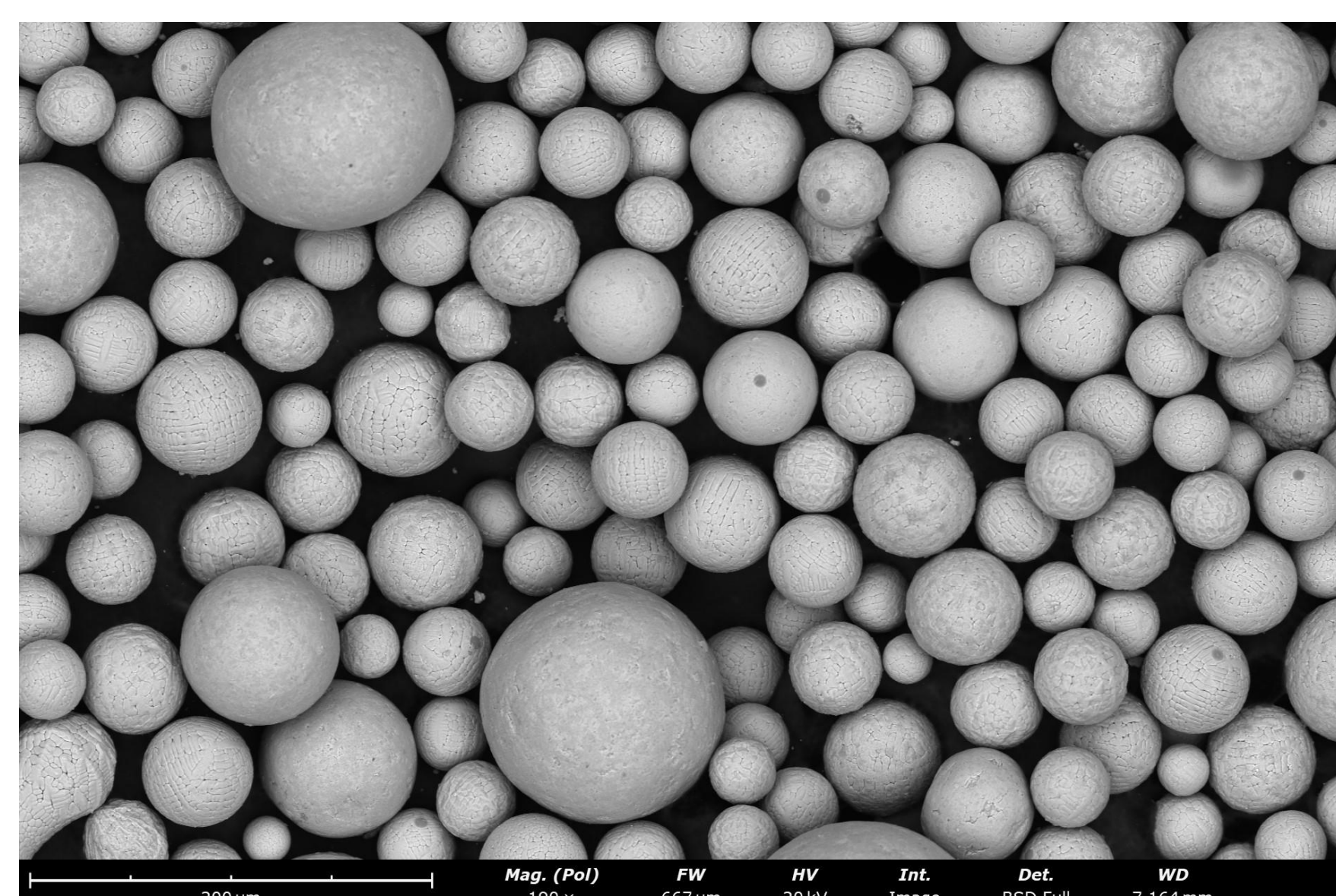
L-DED on cast iron components is a difficult and a complex process. The heterogeneous thermal and stress fields formation as a result of the graphite and matrix properties, formation of carbon dioxide produced pores and the formation of hard and brittle phases due to the high cooling rate may lead to crack formation.

In order to provide a way to perform L-DED coating on cast iron surface, a metallic powder (Ni-Ti alloy) was designed and developed to use it as a paint for cast iron moulds allowing subsequent L-DED deposition to increase corrosion resistance and/or wear resistance of the cast iron part. The Ni-Ti powder was produced by ultrasonic atomization process.

Ni-Ti POWDER ATOMIZATION

The atomization process was carried out in an ATO Lab+ ultrasonic powder atomizer. 30-90 µm spherical particles were obtained with a narrow size distribution.

Atomization Conditions	
Ultrasound platform	Ti 35 kHz
Ar flow	20 L/min
Pump power	70 %
Arc intensity	100 A
Ultrasound amplitude	80 %



Apart from minor variations, the main change in the composition of the powder was the fading of Mn (~38 %).

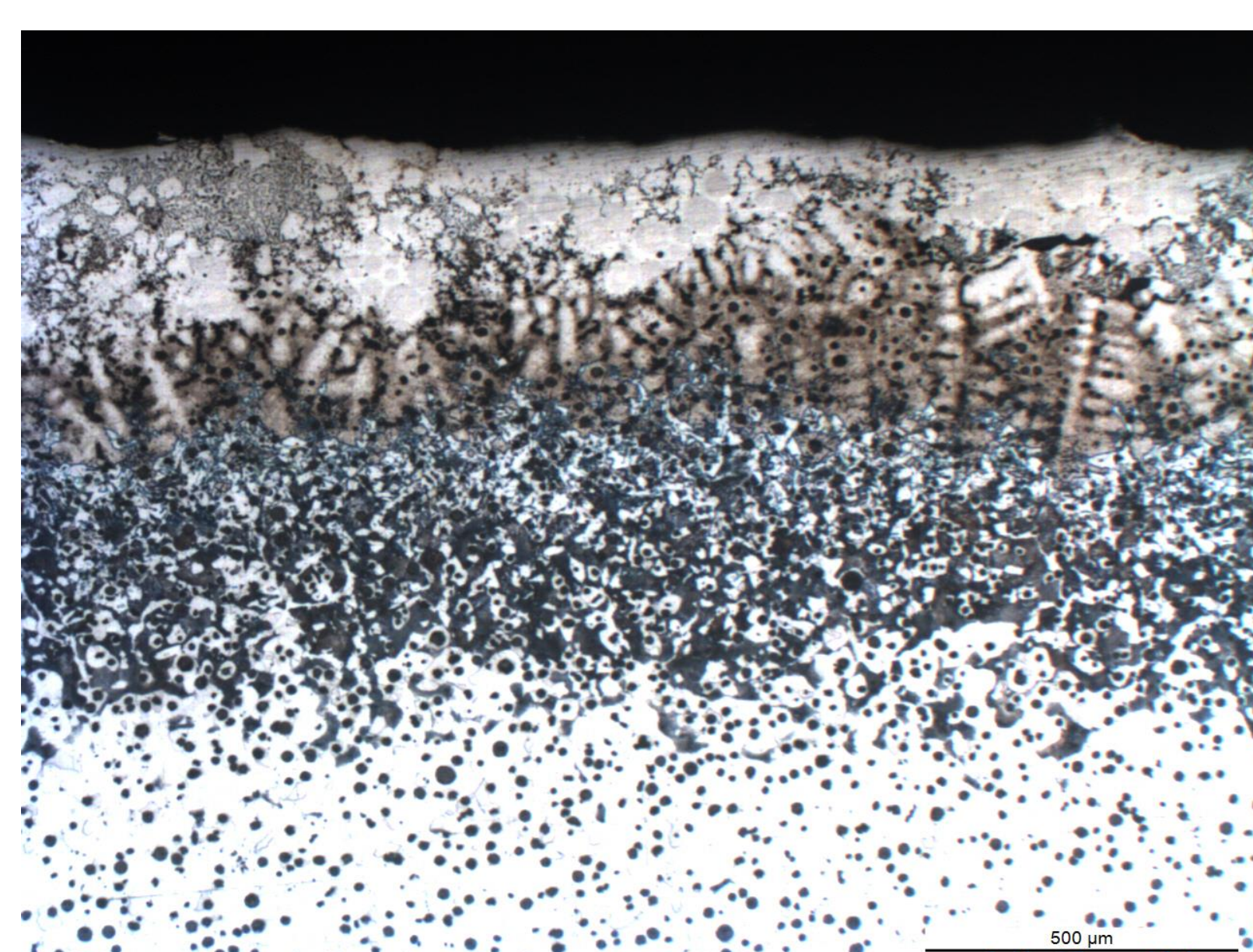
Reference	Ni	Ti	C	S	O	N	Si	Mn	P	Cu	Al	Fe
Ni-Ti wire	96.1	3.02	0.017	<0.005	0.003	<0.002	0.38	0.42	<0.01	<0.08	0.05	<0.1
Atomized Powder	96.1	3.13	<0.010	<0.005	0.054	0.004	0.41	0.26	<0.01	<0.08	0.05	<0.1

CAST IRON L-DED COATING

The Ni-3Ti powder was mixed with a binder that was applied as a coat in the sand mold and dried by at least 24 hours. High silicon cast iron was poured into the sand mold avoiding direct pouring onto the coating. A Ni-Ti layer was linked to the cast iron surface during the melting.

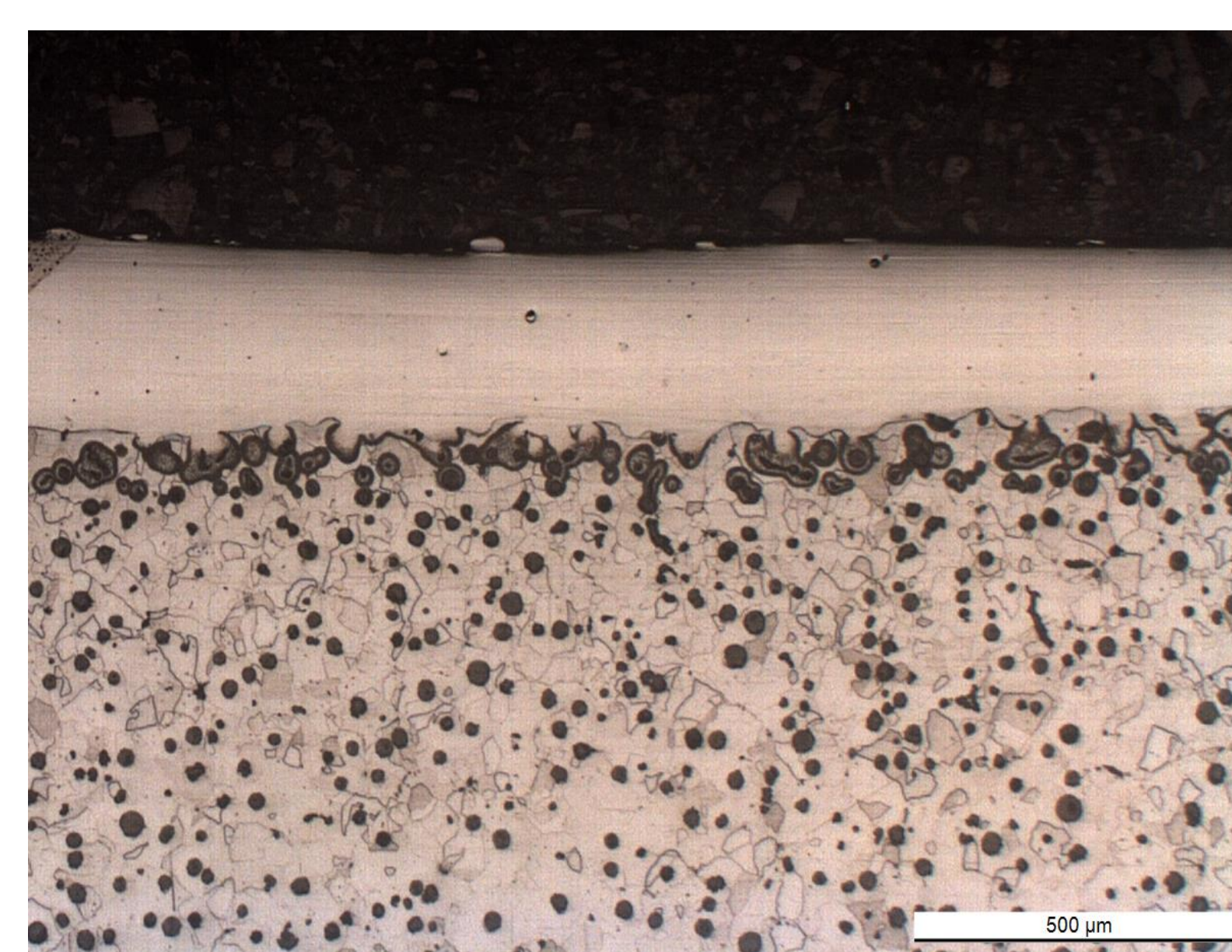
The casting surface was shoot blasted and the interface Ni-rich was used for depositing a L-DED single layer with Inconel 625 powder.

Cast Iron surface with Ni-Ti coating (as-cast)



Ni-Ti coating

L-DED Inconel 625 Coating



Inconel 625

CONCLUSIONS

It is possible to apply a hard coating (Inconel 625 coating) over cast iron by introducing an intermediate diffusion layer of a powder base Ni-3Ti alloy.

This method avoid the formation of pores, hard carbides or other brittle phases.