



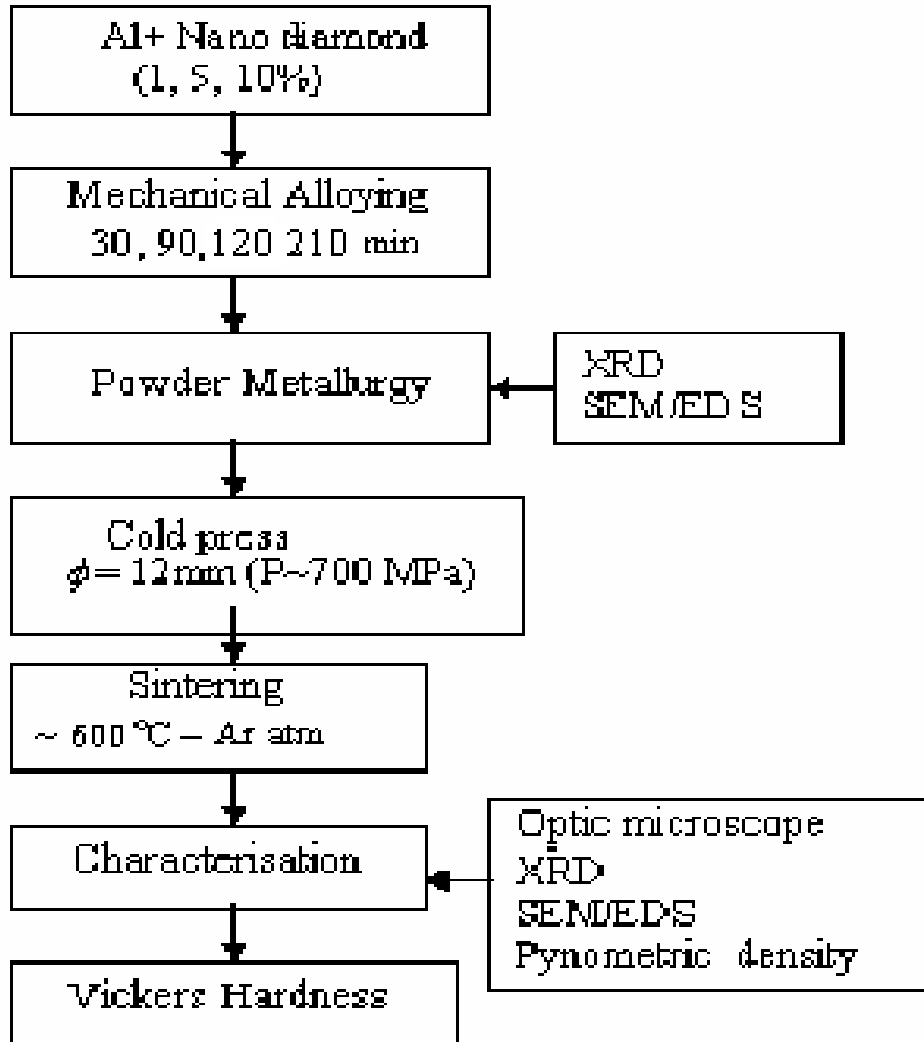
NANO-DIAMOND REINFORCED ALUMINIUM MATRIX COMPOSITES

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MATERIALS & METHODS



Aluminium(Al)

10 µm-98.88% purity

Alfa Aesar

Ultra Dispersed Nano Diamond (UDDP)

20-50 nm

ALIT Inc., Ukraine

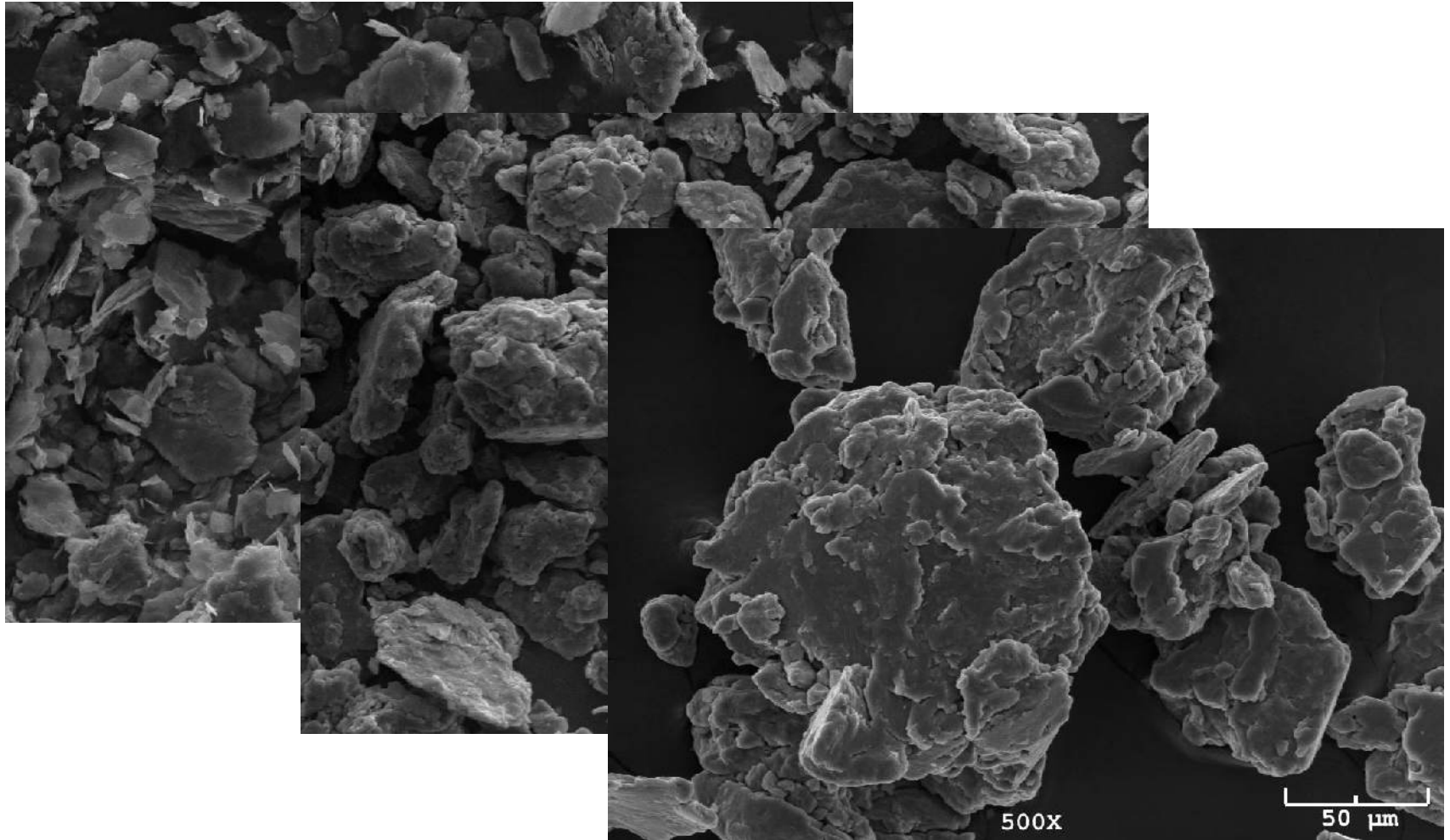
Condition of Mechanical Alloying

Mass of powder (g)	8	PCA (En stearat) (wt %)	2
Charge ratio (mass of grinding balls : mass of powder mill)	7:1	MA atmosphere	Ar
Steel ball diameter (mm)	6.35	Working environment	dry



**Milling equipment, dual spex
8000D
Powder Metallurgy lab.,
Department of Metallurgical
and Materials Engineering,
I.T.U**

SEM Images of the Al-5 wt%UDDP MA'd for 30/60/120 min



BET Results of Composite Powders

Compositions	Milling time (min)		
	30	90	120
	Surface Area (m ² /g)		
Al-UDDP (1 wt %)	5.25	1.468	1.330
Al-UDDP (5 wt %)	9.772	1.488	1.112
Al-UDDP (10 wt %)	18.57	2.813	2.009

As received powders:

Al powder: 1.785 m²/g

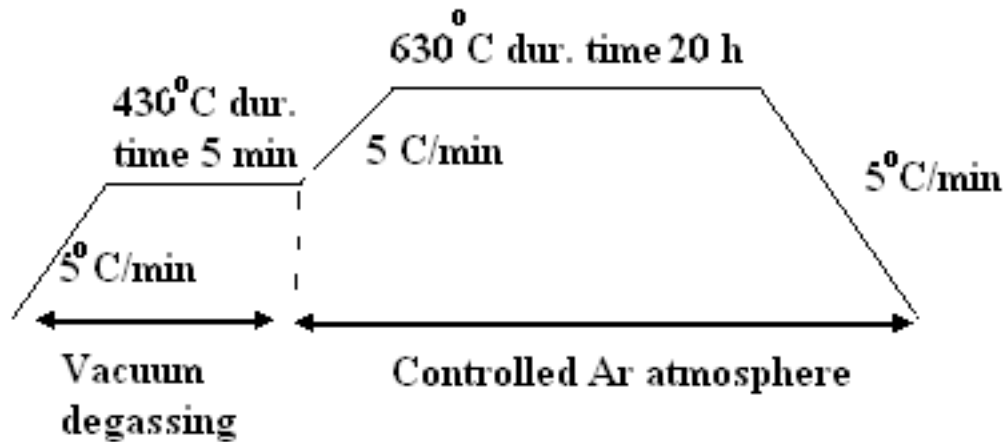
UDDP powder: 297 m²/g

Outgas temperature: 150°C



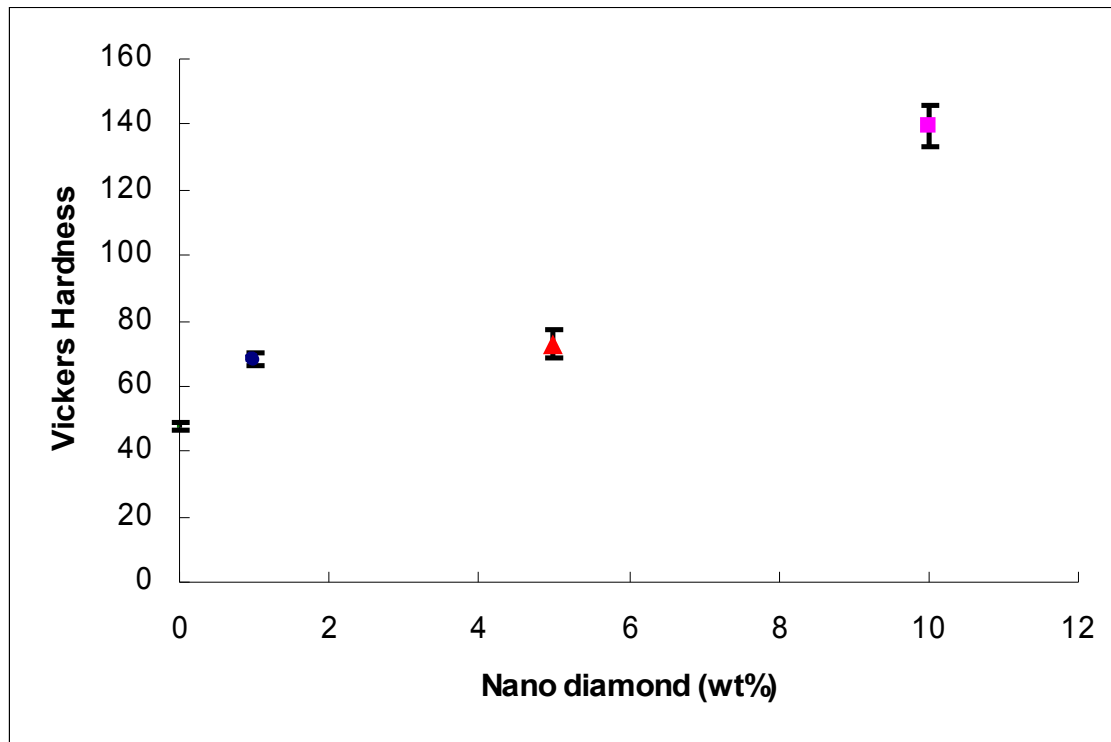
Quantachrome™ , Autosorb 1C
instrument
Powder metallurgy lab.,
Department of Metallurgical and
Materials Engineering, I.T.U

Sintering Conditions



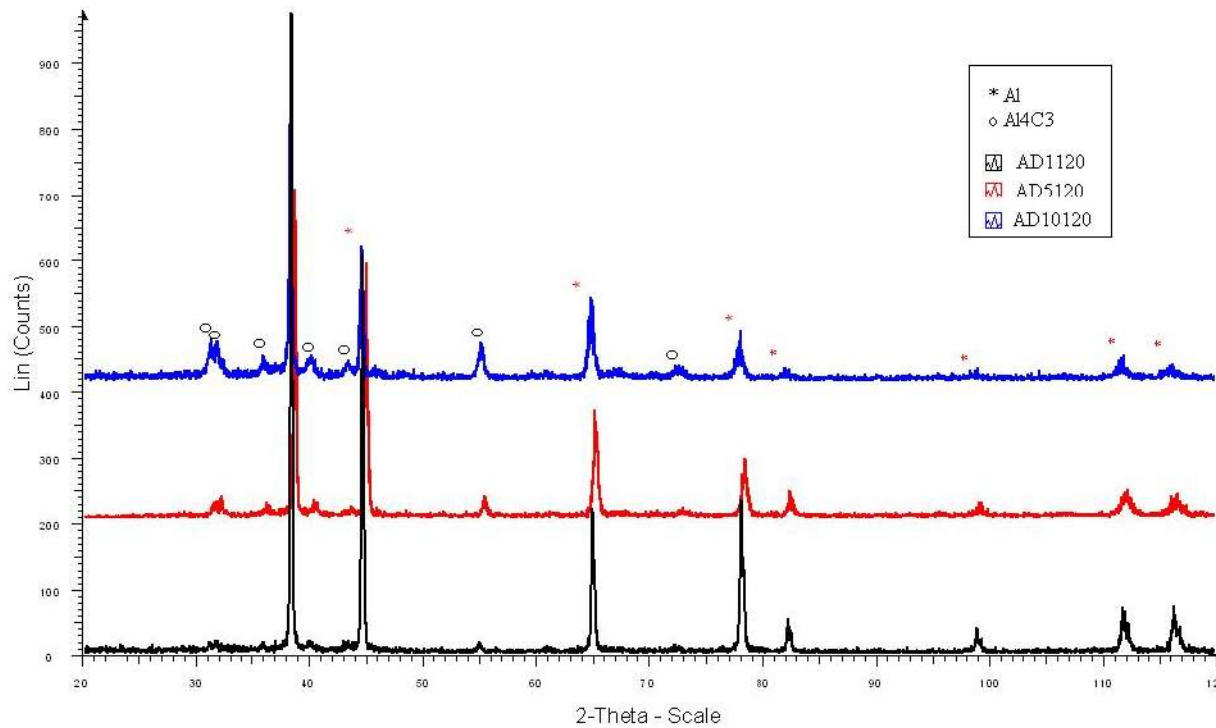
**Gas controlled Linn™ Furnace
Powder metallurgy lab.,
Department of Metallurgical
and Materials Engineering,
I.T.U**

Vickers Hardness of Sintered Samples



Sample	HV	S.Dev
Al	47.6	± 1.069
Al+1% UDDP	68.1	± 2.136
Al+5% UDDP	72.8	± 4.612
Al+10% UDDP	130	± 6.24

XRD Patterns of Sintered Samples (Al; Al+1wt %UDDP; Al+5%wt UDDP; Al+10wt% UDDP)





THANK YOU