بسم الله الرحمن الرحيم

شبكة المعلومـــــات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

﴿ قـــســـم ﴾

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد اعدت دون آية تغيرات

يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

في درجة حرارة من 15 – 20 مئوية ورطوبة نسبية من 20-40 %

To be kept away from dust in dry cool place of
15 – 25c and relative humidity 20-40 %

بعض الوثائق الأصلية تالفة

بالرسالة صفحات

لم ترد بالأصـــل

STUDY OF Ti-Al BASED ALLOYS

M.SC. THESIS

SUBMITTED TO

Physics Department

Faculty Of Science

Suez Canal University

BY

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بسم الله الرحمن الرحيم

To My Father's Memorial

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SUMMARY

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Elemental powders of Al and Ti with compositions, Al-(20, 40 and 60wt.%) Ti with the same amount of n-heptane were mechanically alloyed in ball milling "Attritor". Milling was carried up to 120-130 hours for the first two systems while for the third one to 90 hours, in an inert atmosphere at room temperature. X-Ray Diffraction (XRD), Optical Microscope (OM), Scanning Electron Microscope (SEM) and Differential Thermal Analysis (DTA) characterized the alloyed systems. The powder particles of Ti and Al interact with each other forming Al_3Ti and Ti_3Al intermetallic. Mechanochemical reactions took place between metals and liquid heptane, where the reactivity was enhanced by dry pre-milling of the metals powders for 50h. The heptane decomposed into carbon and hydrogen, forming f.c.c. TiC, and $Al_2Ti_4C_2$. The hydrogen that is released as another product of n-heptane decomposition could have some effect on the alloying process. However, there is no hydride phase was observed by XRD, possible hydride phase formation in a small quantity can not be excluded to occur during milling. While Al_3Ti and Ti_3Al intermetallic did not react with carbon or hydrogen. From the change in the lattice parameter of Al after 50h of MA (Al-20wt.%Ti), the solubility of Ti in Al could be estimated to be $\approx$ 3.2at.%Ti. With the progression of the milling time, the particle size was effectively reduced and the grain size becomes in the nanoscale. The XRD patterns showed that, the Ti concentration plays an important role for the system amorphization, where the amorphous phases were seen to be more rapidly formed with increasing Ti content. It is possible to say that, at the final stage, one might have an in-situ composite in amorphous base.

ABBREVIATIONS

DTA	Differential Thermal Analysis
XRD	X-Ray Diffraction
SEM	Scanning Electron Microscopy
OM	Optical Microscopy
MA	Mechanical Alloying
NCM	NanoCrystalline Material
b.c.c.	Body Centered Cubic
f.c.c.	Face Centered Cubic
h.c.p.	Hexagonal Close Packed
rms	Root Mean Square
rpm	Revolution Per Minute
TEM	Transmission Electron Microscopy
HREM	High Resolution Electron Microscopy
FWHM	Full Width at Half Maximum Intensity

SYMBOLS

Al	Aluminum
Ti	Titanium
C	Carbon
θ	Bragg Angle
β_{hkl}	Full Width at Half Maximum Intensity of hkl reflection
λ	Wavelength
K	Wave vector
$\langle e^2 \rangle^{1/2}$	Root Mean Square of Strain
X_{cr}	Crystalline Fraction
I_{cr}	Integrated Intensity Under XRD Peaks
$I_{tot.}$	Integrated Intensity Under The Whole XRD Pattern
φ	Heating Rate
L_{hkl}	Particle Size
a_{Al}	Lattice Parameter of Aluminum
a_{Al3Ti}	Lattice Parameter of Al_3Ti

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