

工業技術研究院

Industrial Technology
Research Institute

CT and micro-CT Technique for 3D Structure Investigation: Getting the Inside Story

Dusty Lin PhD

Industrial Technology Research Institute

Multiscale Micro-CT/Nano-CT Service

Biomedical Service

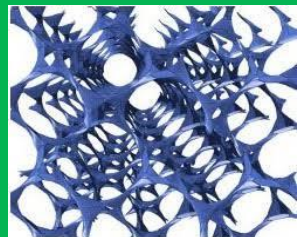


Drug/Gene Therapy
Animal Disease Models

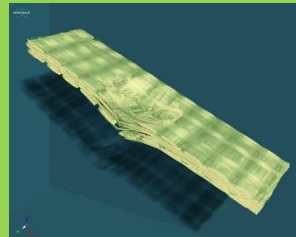


Advance Medical Device
Development

Porous Material
3D Analysis



Complex Fiber
3D Analysis



3DIC
Analysis



影片資訊
YahooTV【鄉民出任務】台灣勸生態 就靠跨域x人才!
Yahoo 網路電視行銷 · 455,993 次觀看 · 10 天前
中美貿易戰還沒打完，新疫情又蔓延全球，台灣該怎麼面對這樣的國際局勢與挑戰的困境？鄉民女神葉宛蓀日前擔任出任務，與知名主持人李永廉搜尋台灣的出路！

ITRI Lab is located to the birthplace of TSMC.



ITRI X-ray nano-CT Team provides 3DIC Analysis

電子與產品開發: Dr. SC Lou; sclou@itri.org.tw

Multiscale nano-CT Group (ITRI)

Nano-CT/ μ XRF/Nano-Indentation/SEM/EDS

工業技術研究院
Industrial Technology
Research Institute

骨材研發
首選專業團隊

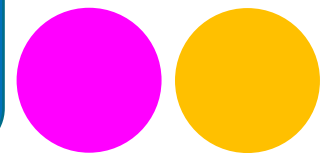
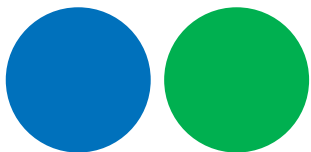
輪廓設計 斷層掃描 脫水處理 切片研磨 染色觀察

生醫 / 醫材 / 新藥

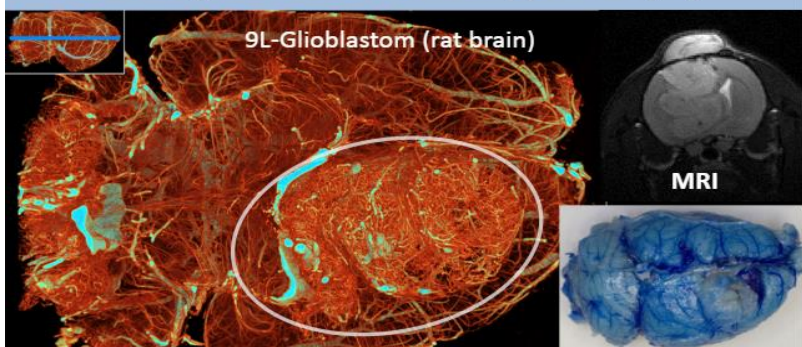


生醫 / 醫材 / 新藥 **Dr. Dusty Lin; DustyLin@itri.org.tw**

CENTRE OF CELL THERAPY/DRUG RESEARCH/MEDICAL DEVICE



MicroangioCT: Correlative approach (III)



Contrast Enhanced CT Scan



國立臺灣大學分子生醫影像研究中心
National Taiwan University Molecular Imaging Center



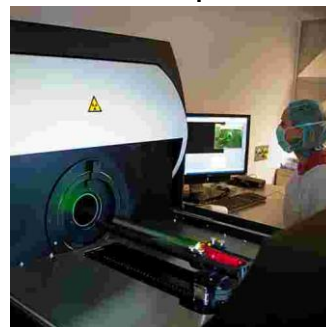
Bruker 7T μ MRI



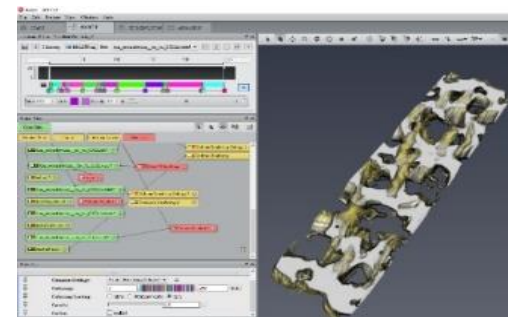
Bruker PET/CT



Bruker μ -CT



Bruker nano-CT
Professional 3D Software



SOLVE YOUR PROBLEMS and MAKE YOUR IDEA COME TRUE!
Combination of animal micro-CT, nano-CT, micro-MRI, animal PET and professional 3D software. (整合高階儀器/醫師團隊來解決臨床前試驗影像需求)

ITRI MULTISCALE NANO-CT LABORATORY



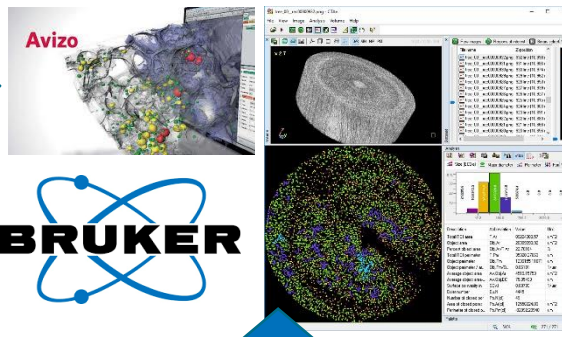
ITRI

Industrial Technology
Research Institute

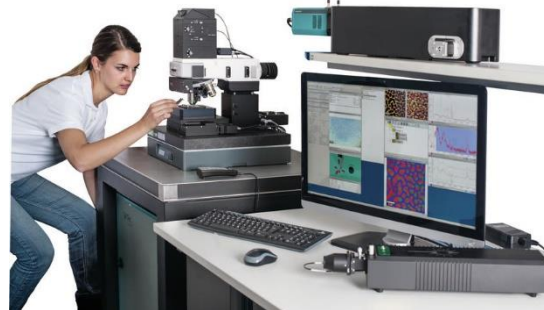
Combined CT data with
XRF/XRD/SEM/EDS



Image Visualization and Data Analysis



AFM/RAMAN



Skyscan 2211



SkyScan 1272



Live Animal Service
using Clinical CT

AFM and Raman
System

High Resolution/High
Contrast/Max190 kVp
Ex vivo nano-CT

協助肺纖維化與抗癌新藥開發

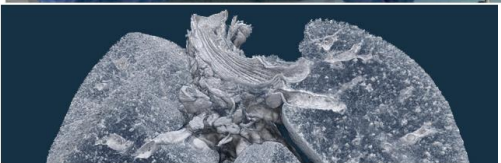
(COVID-19相關)肺纖維化新藥開發迫在眉睫與臨床前抗癌新藥開發勢在必行

工研院引進國際最新技術與醫界結合，建立高速且精確的影像辨識進行病灶分析和療效評估提供在地化高效率臨床前藥物功效性檢測，大幅縮短試驗時間與動物數量，協助台大醫最新肺臟纖維化之新藥開發，並與台大醫專業團隊合作協助生醫製藥產業。

同步歐美最新檢測技術

World's First in vivo COVID-19 Imaging Experiments

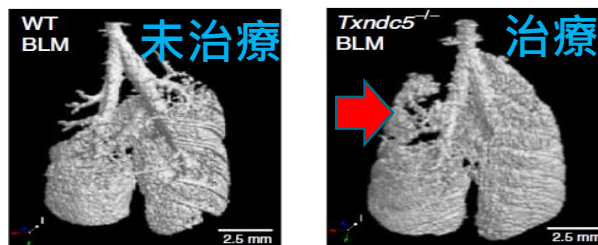
publication date: Jul 27, 2020 | author/source: Bruker Corporation



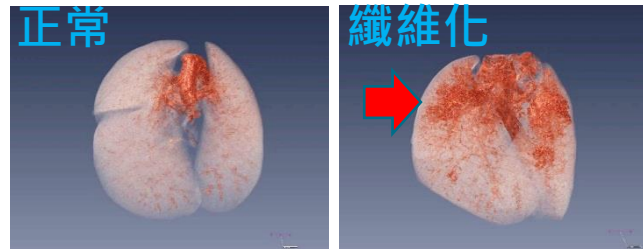
How Micro-CT is being used in some of the World's First in vivo COVID-19 Imaging Experiments



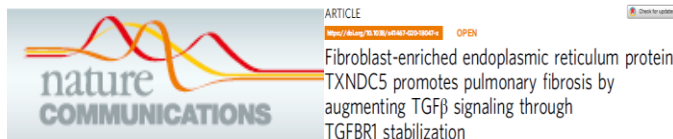
高速與精確辨識模式建立



小鼠活體療效評估



肺纖維化病灶判讀



台大醫/芝加哥/工研院 團隊

肺纖維化新藥開發平台

新冠病毒肺纖維化治療新契機 台大醫院最新發現關鍵蛋白促新藥開發



協助新穎積層印列與可降解醫材開發

全球骨科醫材市場規模為384億美元(2017)，國產新穎醫材開發勢在必行

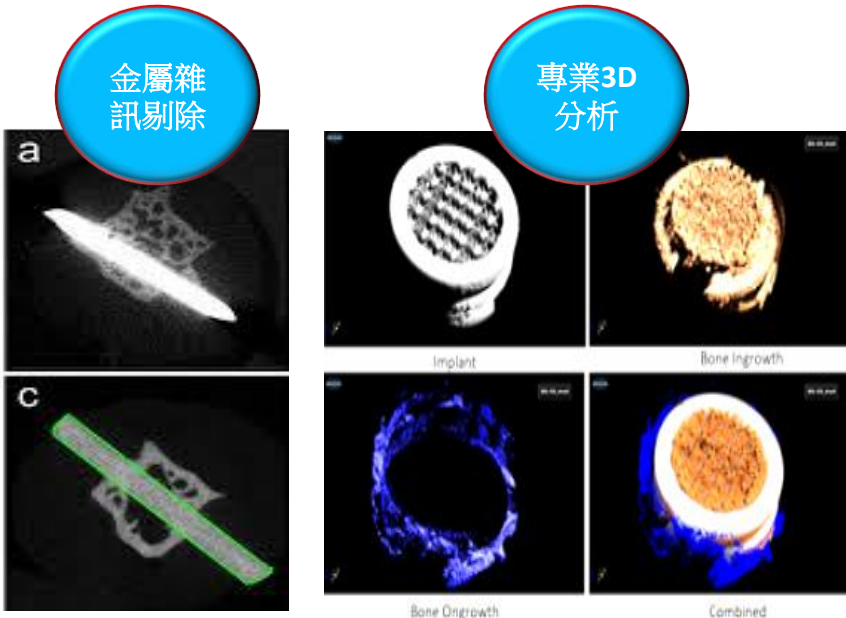
透過**高穿透特殊對比3D檢測**分析可降解積層印列醫材在動物內之**骨相容性與功效**，並需要觀察動物內**金屬3D結構降解狀況**，需要能克服金屬雜訊之3D檢測。本計畫整合**高穿透奈米CT檢測和專業3D影像分析系統**，結合工研院生醫所先進製程與材料改善，加速其產品開發與論文發表。

金屬雜訊剔除3D檢測

整合臨床單位加速產品驗證

建立克服金屬雜訊之3D檢測檢測醫材狀況

與骨科/牙科/材料 專業團隊整合進行上市前檢測



工研院醫材牙材開發技術特點

業界面臨問題：
植體之**金屬雜訊**與判讀
困難 檢測時程長

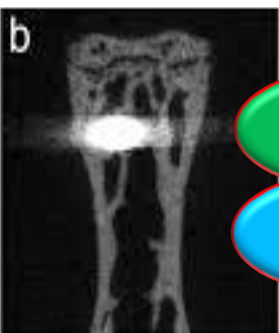
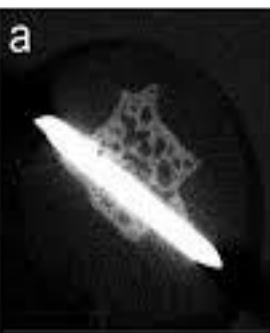
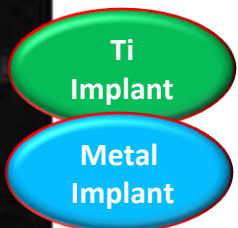
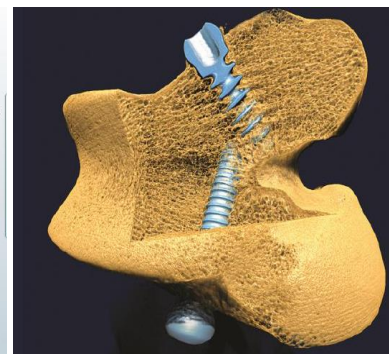
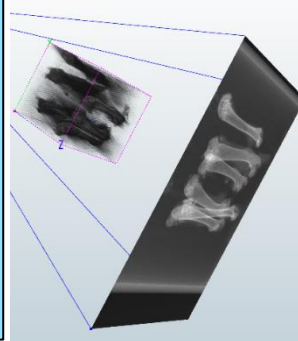
解決方法

設備精進
高穿透高解析
降低金屬雜訊

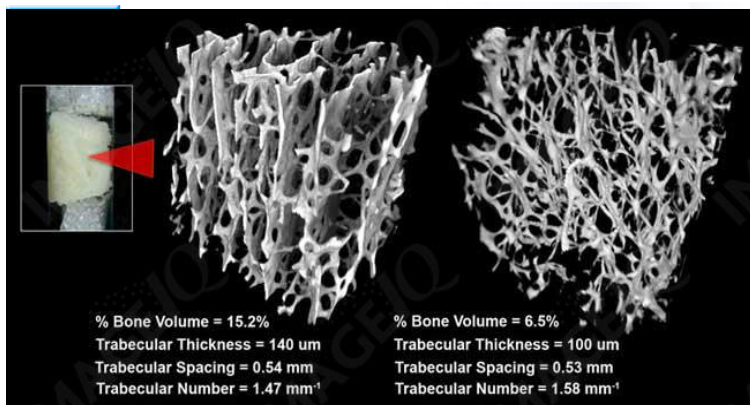
演算精進
減少金屬
雜訊干擾

知識整合
XCT-骨科-醫材
專業解析判讀

ITRI:
190-225 kVp
學界:
90-100 kVp
檢測單位:
140-160 kVp



完整整合醫材需求
斷層掃描檢測 臨床專業 動物試驗



檢測	孔隙鈦	孔隙鈦	金屬材	金屬材
	民間檢測	ITRI	民間檢測	ITRI
植體周圍	▲	●	⊗	●
孔隙內部	▲	●	⊗	⊗

- 骨材
- 牙材
- 複材 (金屬/高分子)

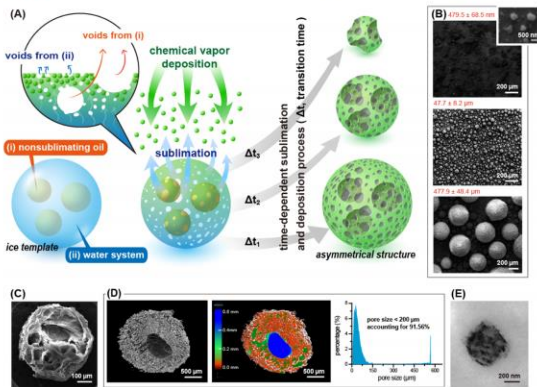
影像團隊參與新穎醫材開發與新藥開發成果 2020

Fabrication of Asymmetrical and Gradient Hierarchy Structures of Poly-*p*-xylenes on Multiscale Regimes Based on a Vapor-Phase Sublimation and Deposition Process

Ya-Ru Chiu, Yao-Tsung Hsu, Chih-Yu Wu, Tzu-Hung Lin, Yu-Zhen Yang, and Hsien-Yeh Chen*

Cite This: Chem. Mater. 2020, 32, 1120–1130

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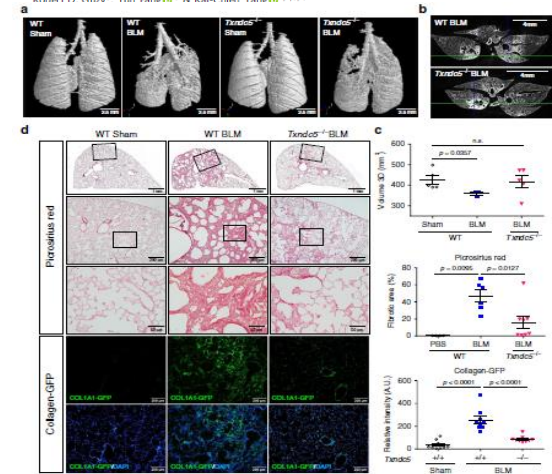
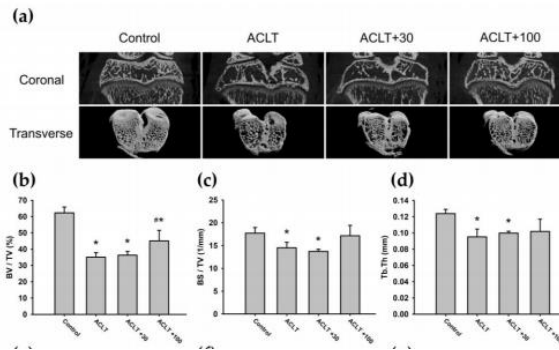


Noggin Inhibits IL-1 β and BMP-2 Expression, and Attenuates Cartilage Degeneration and Subchondral Bone Destruction in Experimental Osteoarthritis

Szu-Yu Chien^{1,2}, Chun-Hao Tsai^{3,4}, Shan-Chi Liu⁵, Chien-Chung Huang^{2,6}, Tzu-Hung Lin⁷, Yu-Zhen Yang⁷ and Chih-Hsin Tang^{2,5,9,10,*}

Fibroblast-enriched endoplasmic reticulum protein TXNDC5 promotes pulmonary fibrosis by augmenting TGF β signaling through TGFBR1 stabilization

Tzu-Han Lee¹, Chih-Fan Yeh^{1,2}, Ying-Tung Lee¹, Ying-Chun Shih¹, Yen-Ting Chen¹, Chen-Ting Hung¹, Ming-Yi You¹, Pei-Chen Wu¹, Tzu-Pin Shentu³, Ru-Ting Huang³, Yu-Shan Lin¹, Yueh-Feng Wu⁴, Sung-Jan Lin^{4,5,6}, Frank-Leigh Lu⁷, Po-Nien Tsao^{5,7}, Tzu-Hung Lin⁸, Shen-Chuan Lo⁸, Yi-Shuan Tseng¹, Wan-Lin Wu¹, Chung-Nien Chen⁹, Chau-Chung Wu^{2,10}, Shuei-Liong Lin^{5,11,12}, Anne I. Sperling³, Robert D. Guv³, Yun-Fan¹³ & Kai-Chien Yano^{1,2,6,13}



Material Science/Dental Research:
Combine high-end nano-CT
and SEM/Confocal
Pore and Structure 3D analysis
Chemistry of Materials, 2020
NTU/NTUH/ITRI

Orthopaedic Research:
The application of micro-CT on
osteoarthritis research
Cells, 2020
CMU/ITRI

Gene Therapy/Lung Fibrosis:
The application of micro-
CT/nano-CT on idiopathic
pulmonary fibrosis model
Nature Communications, 2020
NTU/NTUH/UIC/ITRI

影像團隊參與新穎醫材開發與新藥開發成果 2020

The Application of Nano/Micro-CT to Preclinical Dental Research and Dental Device Development

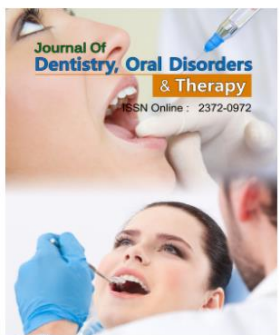
Tzu Hung Lin¹, Pei Yi Tsai², Pei-Ying Lu³ and Yu Chih Chiang^{3*}

¹Material and Chemical Research Laboratories, Industrial Technology Research Institute, HsinChu, Taiwan, ROC

²Biomedical Technology and Device Research Laboratories, Industrial Technology Research Institute, HsinChu, Taiwan, ROC



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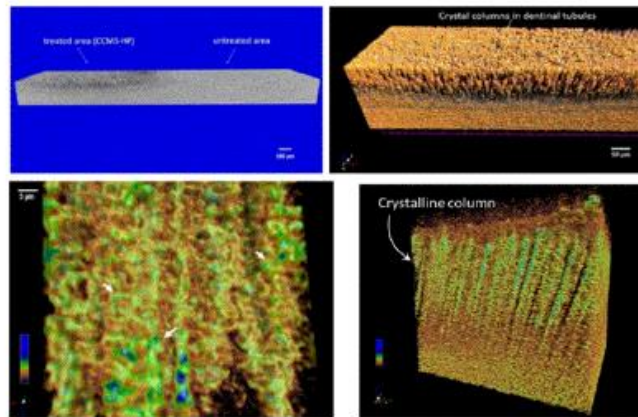


Figure 2: Micro-CT images showed the 3D information of crystal columns in dental tubules.

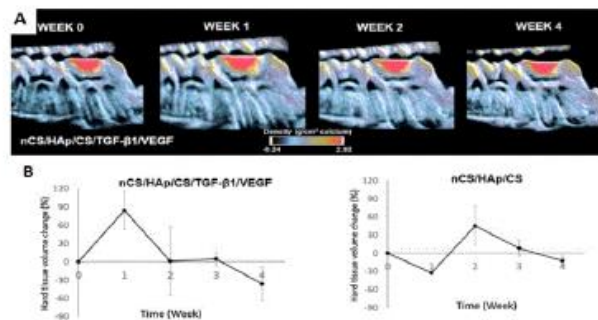


Figure 3: In vivo micro-CT showed 3D information of the calcified hard tissue volume and distribution at different time point.

Bone/Dental Research:
Combine ex vivo nano-CT
and in vivo micro-CT
Pore and Structure 3D analysis
JDODT, 2020
ITRI/NTUH

Multiscale nano-CT Application (ITRI/MCL)

Many thanks to my teammates in ITRI. I love you so much! Happy new year!

