



材料科學工程學系 賴志煌 清華講座教授

賴志煌教授長期致力於先進半導體材料、磁性記憶體、先進封裝與能源材料等跨領域研究，並以「深耕學術核心技術、發展創新材料與製程；建立長期產學夥伴關係、促進技術落地與產業創新」為產學合作理念，持續強化基礎研究、技術開發與產業應用之間的連結。

在新興記憶體領域，賴教授長期投入磁性記憶體（MRAM）及自旋電子技術，探索下一代低功耗、高密度資訊儲存元件所需的關鍵材料、物理機制與元件技術，相關研究成果發表於 *Nature Materials*、*Advanced Materials* 等國際頂尖期刊，展現其在先進磁性材料與自旋電子元件領域的深厚研究基礎。近年亦積極拓展永續能源與資源循環研究，涵蓋低碳鋰電池、關鍵材料回收與再生技術，致力於建立兼具材料創新與循環利用的永續技術平台。

面對 AI 時代高效能運算快速成長所帶來的散熱、供電與異質整合需求，賴教授進一步布局先進封裝技術，研究範疇涵蓋系統層級熱管理、晶片層級熱傳材料、中介層級電源管理及玻璃基板接合等關鍵技術。透過跨領域研究與產業合作，整合材料、製程、元件與系統應用，建立垂直整合的研發架構，以回應高功率半導體元件在熱管理、電源傳輸與先進封裝整合上的關鍵挑戰。

在產學合作方面，賴教授重視由產業實際需求出發，結合基礎研究、材料分析、製程開發與技術驗證，將學術研究成果轉化為可實際導入產業的材料、製程與元件技術。近三年累積執行 25 件產學合作計畫，並完成多項技術移轉，持續推動創新材料與製程由實驗室走向產業應用。透過長期累積核心技術、整合跨領域研發能量以及與企業建立持續性的合作關係，形成從基礎研究、技術驗證到產業落地的完整創新鏈結。

賴教授的研究與產學成果長期獲得國內外肯定，曾獲潘文淵傑出研究獎、教育部學術獎、有庠科技講座，並獲選為 Asia Pacific Academy of Materials (APAM) 院士及 IEEE Fellow。此次榮獲國立清華大學傑出產學研究獎，更彰顯其長期結合學術研究、技術創新與產業需求，並推動研究成果轉化為實際產業影響力的持續貢獻。

Professor Chih-Huang Lai has built his research career at the intersection of advanced semiconductor materials, magnetic random-access memory, advanced packaging, and energy materials. His approach to industry–academia collaboration is rooted in a simple principle: develop strong fundamental technologies and new materials in academia, while working closely with industry to translate these advances into manufacturable processes, devices, and technologies with real-world impact.

In emerging memory technologies, Professor Lai has made sustained contributions to magnetic random-access memory (MRAM) and spintronics, with particular emphasis on the materials, physical mechanisms, and device concepts required for next-generation low-power and high-density information storage. His work has been published in leading journals including *Nature Materials* and *Advanced Materials*. Building on his expertise in materials science and interfacial engineering, his research has also expanded toward sustainable technologies, including low-carbon lithium batteries and the recycling and regeneration of critical materials, with the goal of enabling more circular and resource-efficient material systems.

To address the rapidly growing demands of AI and high-performance computing, Professor Lai has further established research programs in advanced semiconductor packaging. His work spans system-level thermal management, chip-level thermal materials, interposer-level power management, and glass-substrate bonding technologies. By integrating materials, processes, devices, and system considerations, and by working closely with industrial partners, his group is developing vertically connected solutions to key challenges in heat dissipation, power delivery, and heterogeneous integration for high-power semiconductor systems.

A defining feature of Professor Lai’s industry collaboration is its close connection to real technological needs. His projects integrate fundamental research, advanced materials characterization, process development, and technology validation, allowing scientific discoveries to progress toward industrial implementation. Over the past three years, he has led 25 industry-sponsored research projects and completed multiple technology transfers. Through sustained collaboration with leading semiconductor, data-storage, energy, and related technology companies, his research has helped translate fundamental discoveries into practical and manufacturable technologies while strengthening the connection between academic innovation and industrial development.

Professor Lai’s contributions have received broad recognition in Taiwan and internationally. His honors include the Pan Wen-Yuan Prize for Outstanding Research, the Ministry of Education Academic Award, the Y. Z. Hsu Science and Technology Chair Award, Asia Pacific Academy of Materials (APAM) Academician, and IEEE Fellow. His receipt of the National Tsing Hua University Outstanding Industry–Academia Research Award further recognizes his sustained contributions to bridging fundamental research, technological innovation, and industrial impact.