側向共振式原子力顯微術

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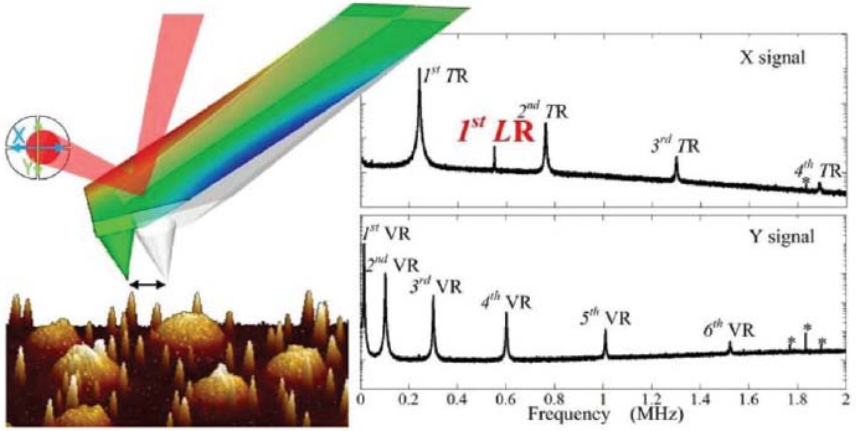
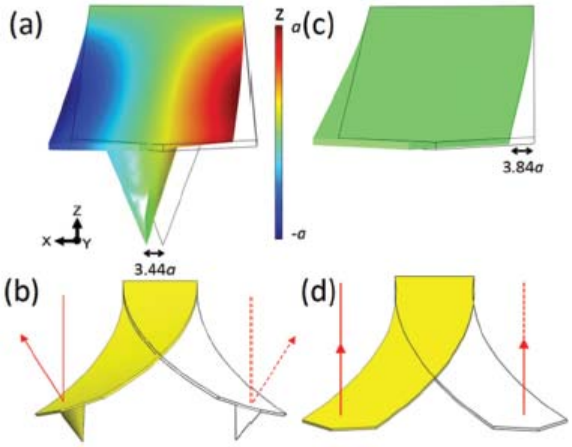
原子力顯微術(Atomic Force Microscopy, AFM)已廣泛地應用於物質表面結構與機械特性的研究。最近由表面奈米科學實驗室黃英碩研究員所帶領的研究團隊與台灣大學機械所黃光裕老師合作開發一新技術，側向共振式原子力顯微術。一般輕敲式懸臂作垂直彎曲振盪，在此新模式懸臂作側向彎曲振盪，過去認為側向共振無法被量測到，因此不被認為可用於原子力顯微術的操作，此研究顯示懸臂末端的探針質量造成側向共振可以在一般原子力顯微術的架構量測到。側向共振式原子力顯微術可以靈敏地偵測物質表面結構及高解析量測材料的側向機械特性，與輕敲式的量測材料縱向機械特性形成互補。特別的是側向共振有高品質因子與很高共振頻率，對於發展高速原子力顯微術成像技術，具有非常有利的助益。





Lateral-Resonance Atomic Force Microscopy

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Atomic Force Microscopy (AFM) has been widely used to characterize the morphology and mechanical properties of material surfaces. The Surface and Nanoscience Lab led by Ing-Shouh Hwang in collaboration with the group of Prof. Kuang-Yuh Huang in National Taiwan University have developed a new AFM technique, lateral resonance (LR) mode. In this mode, the AFM cantilever is oscillated in a lateral resonance, in contrast with the vertical resonance in the typical tapping mode. The LR mode was not considered in AFM operation because it was believed that LR cannot be detected. This study shows that the presence of a large tip is the major factor causing LR to be detected with current AFM setup. The LR mode allows high-sensitivity imaging of the sample morphology and high-resolution measurement of lateral mechanical properties of the sample. It complements the tapping mode, which allows detection of vertical mechanical properties. Particularly, the LR has a high quality factor and a very high resonance frequency, which are beneficial for high-speed AFM operation.