

化学コントラストマッピング：周波数シフト最小値の直接検出法

Study on the Bottom Tracking Technique for Chemical Contrast Imaging.

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We have recently developed a novel nc-AFM technique allowing simultaneous acquisition of topography and chemical contrast. The method involves a small dithering of the tip-sample distance in order to detect the bottom of the frequency shift curve (Δf_{\min}) on each point of the surface while scanning. For small variations of the width of the frequency shift curves, the local minima of the frequency shift are monotonously linked with the atomic force and potential minima. This technique offers faster and simultaneous acquisition of chemical contrast and topography between different chemical species compared to the conventional equi-frequency shift control technique. The local minima of frequency shift could be mapped in real-time without crashing the tip and up to a scanning area of around $100 \times 100 \text{ nm}^2$. The second flexural resonance mode of a Silicon cantilever at 2 MHz was used to detect the interaction between the tip and different multi-element surfaces. We will report on these recently obtained results and discuss the preferable operating range in order to avoid influence of the operating point during data acquisition. We will also discuss how the experimentally acquired data can be treated in real-time to reveal physical quantities and to achieve a state where quantitative evaluation of the surface becomes accessible.

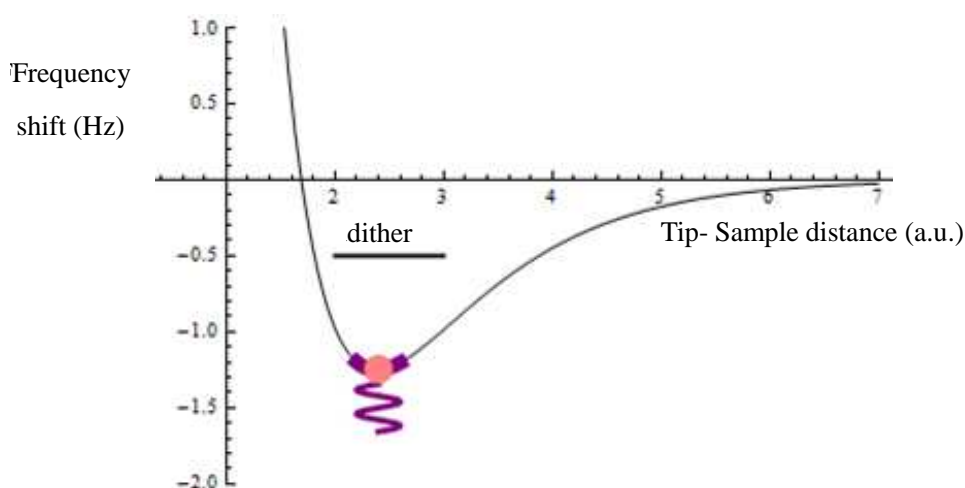


Fig. 1 Schematic of the bottom tracking technique. At the working point, topography and chemical contrast can be simultaneously performed.