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Chemical Reagents for Attaching Recognition Molecules on Surfaces

Molecular diagnostics is a rapidly growing area in personalized medicine. The most commonly used immunological technologies can effectively measure proteins at concentrations above 10-12M. Unfortunately, many protein markers are found at concentrations below 10-15M. Signal amplification techniques have been developed to increase sensitivity but they involve additional process steps resulting in increased labor, costs, and time.

Atomic Force Microscopy (AFM) has been used successfully with pico-newton sensitivity for biomolecule analysis and recognition imaging (using a functionalized tip to image a molecular target on a surface), making it an ideal candidate for identification and quantitation of low concentrations of proteins in clinical diagnostics. However, common methods for tip functionalization are problematic and difficult. In order to make AFM a practical tool in molecular diagnostics, tip functionalization has to be both easy and reliable.

Researchers at the Biodesign Institute of Arizona State University have developed a novel and user friendly protocol for attaching recognition (affinity) molecules, such as antibodies, peptides and aptamers, to AFM tips for analysis of biomolecules. Using new linkage chemistry, AFM tips can be efficiently and reproducibly functionalized with various different biomolecules. These functionalized tips can be used for force measurements and imaging of immobilized proteins allowing for detection of disease-relevant proteins with high sensitivity and specificity.

Potential Applications

- AFM single biomolecule analysis
- AFM recognition imaging

Benefits and Advantages

- User friendly and simple protocol
- Efficient and reproducible
- Uniform monolayer in aqueous solutions - this is particularly useful when the chemical is not volatile and vapor deposition would not work
- Applicable to a broad range of affinity molecules
- Detection of biomolecules with high sensitivity and specificity - a few femtomoles of proteins can be readily detected
- Does not leave amino residues left on the tip which can cause spurious signals due to non-specific interactions with the substrate

For more information about the inventor(s) and their research, please see [Dr. Zhang's directory webpage](#)