

Example 13

Modifying Sample Surfaces by Strong Electric Field Around the SPFM Tip

Many physical, chemical and biological processes are influenced by strong electric fields nearby. A biased SPFM tip is used as a tool to modify a sample surface locally, for example, to influence the biological activity of a cell membrane surface.

If a microwave ac voltage is applied on the SPFM tip, it acts as a nano-microwave probe to modify hydrated materials.

Example 15

Imaging Under a Liquid Media

If the media between the tip and sample surface is not vacuum or air but liquids, SPFM is still able to take a polarization image. In this case, the polarization force is decreased by the screen effect of liquid media but still detectable by SPFM.

Example 16

Imaging the structures Inside materials

Using a high alternating voltage frequency on the probe tip so that the surface dielectric constant does not dominate, the structures underneath the surface of sample will make a contribution to polarization force. Under these experimental conditions, SPFM is used to image the structures inside materials. Image reconstruction method, such as that used in tomography, is used to resolve the image.

The description of illustrative embodiments and best modes of the present invention is not intended to limit the

scope of the invention. Various modifications, alternative constructions and equivalents may be employed without departing from the true spirit and scope of the appended claims.

5 Having thus described the invention, what is claimed is:

1. A scanning-force-microscope probe electrode assembly for imaging induced polarization forces comprising,

- a) an electrically conducting scanning-force-microscope probe tip;
- 10 b) a counter electrode located more than the radius of the probe tip away from the probe tip;
- c) a voltage supply connected to the probe tip and the counter electrode;
- 15 d) means to connect the probe tip to a scanning-force-microscope.

2. The apparatus of claim 1 wherein the counter electrode is located between about three times the probe tip radius and about one meter away from the electrically conducting probe tip.

20 3. The apparatus of claim 2 wherein the counter electrode is located between about nine times the probe tip radius and about one meter away from the electrically conducting probe tip.

25 4. The apparatus of claim 1 wherein the counter electrode is located between about 10,000 Å and about one meter away from the electrically conducting probe tip.

30 5. The apparatus of claim 1 wherein the counter electrode is located under a nonconducting sample having a thickness dimension greater than three times the radius of the probe tip.

6. The apparatus of claim 1 wherein the counter electrode is electrically grounded to a ground of the scanning force microscope.

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