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Development of Tuning Fork Based Probes for Atomic Force Microscopy ROMANEH JALILIAN, MEHDI M YAZDANPANAH, NEIL TORREZ, AMIRALI ALIZADEH, NaugaNeedles LLC, 11509 Commonwealth Drive, Suite 2, Louisville, KY 40299, USA, DAVOOD ASKARI, Department of Mechanical Engineering, Wichita State University, Wichita, KS 67260, USA — This article reports on the development of tuning fork-based AFM/STM probes in NaugaNeedles LLC for use in atomic force microscopy. These probes can be mounted on different carriers per customers' request. (e.g., RHK carrier, Omicron carrier, and tuning fork on a Sapphire disk). We are able to design and engineer tuning forks on any type of carrier used in the market. We can attach three types of tips on the edge of a tuning fork prong (i.e., growing Ag_2Ga nanoneedles at any arbitrary angle, cantilever of AFM tip, and tungsten wire) with lengths from 100-500 μm. The nanoneedle is located vertical to the fork. Using a suitable insulation and metallic coating, we can make QPlus sensors that can detect tunneling current during the AFM scan. To make Qplus sensors, the entire quartz fork will be coated with an insulating material, before attaching the nanoneedle. Then, the top edge of one prong is coated with a thin layer of conductive metal and the nanoneedle is attached to the fork end of the metal coated prong. The metal coating provides electrical connection to the tip for tunneling current readout and to the electrodes and used to read the QPlus current. Since the amount of mass added to the fork is minimal, the resonance frequency spectrum does not change and still remains around 32.6 KHz and the Q factor is around 1,200 in ambient condition. These probes can enhance the performance of tuning fork based atomic microscopy.

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