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A convenient method for large scale STM mapping of freestanding atomically thin membranes — •Bernd Uder and Uwe Hartmann — Institute of Experimental Physics, Saarland University, Germany

Two-dimensional sheets atomically flat and with high flexibility are very attractive to be used as ultrathin membranes but inherently challenging for microscopic investigations. We report a method using Scanning Tunnelling Microscopy (STM) under ultrahigh vacuum conditions for large scale mapping of graphene membranes. This is achieved by operating the STM with unusual parameters. We found that large scale scanning on atomically thin graphene membranes delivers viable results using very high tip scan speeds combined with high feedback loop and low tunnelling current settings. This is successful due to a different behaviour of the freestanding membrane in STM compared to a solid substrate. The contrast on a thin membrane is ruled by tip membrane force interactions and the interplay with the integral distance regulator working at high gain. For low tunnelling currents the force interaction is tunable by changing the bias between tip and sample. We applied our method to map differences of membrane quality of commercial available single layer graphene covering 2 micrometer sized holes and multi-layered graphene covering a TEM 2000 mesh.

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