

عنوان مقاله:

Modelling and Analysis of the Hybrid-Nonlinear Dynamics of Tapping Mode Atomic Force Microscopy with Van der Waals, Capillary and Repulsive force Interactions

محل انتشار:

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خلاصه مقاله:

We study the nonlinear dynamics of a tapping mode atomic force microscope with tip-surface interactions that include attractive, repulsive, and capillary force contributions using numerical techniques tailored for hybrid or discontinuous dynamical systems that include forward-time simulation with event handling. We found four branches of periodic solutions that are separated by windows of complex and irregular dynamics. The branches of periodic solutions end where the cantilever comes into grazing contact with event surfaces in state space, corresponding to the onset of capillary interactions and the onset of repulsive forces associated with contact. These windows of irregular dynamics are found to coexist with the periodic branches of solutions as well as exist beyond the termination of the periodic solution. Finally, we show that these details can be overlooked unless one is careful to sample the dynamics appropriately.

کلمات کلیدی:

Atomic force microscopy; Forward-time simulation; Capillary force

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