

## Abstract

In this paper, we study the dynamical behaviour of a microcantilever-sample system that forms the basis for the operation of atomic force microscopes (AFM). We model the micro-cantilever by a single mode approximation and the interaction between the sample and cantilever by a van der Waals (vdW) potential. The cantilever is vibrated by a sinusoidal input, and its deflection is detected optically. We analyze the forced dynamics using Melnikov method, which reveals the region in the space of physical parameters where chaotic motion is possible. In addition, using a proportional and derivative controller we compute the Melnikov function in terms of the parameters of the controller. Using this relation it is possible to design controllers that will remove the possibility of chaos.