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We consider an atomic model of deposition of materials over a quasi-periodic medium. The atoms of the deposited material interact with the medium (a quasi-periodic interaction) and with their nearest neighbors (a harmonic interaction). This is a quasi-periodic version of the well known Frenkel-Kontorova model.

We consider the problem of whether there are quasi-periodic equilibria with a frequency that resonates with the frequencies of the medium. We show that there are always perturbative expansions. We also prove a KAM theorem in a-posteriori form. We show that if there is an approximate solution of the equilibrium equation satisfying non-degeneracy conditions, we can adjust one parameter and obtain a true solution which is close to the approximate solution.

The proof is based on an iterative method of the KAM type. The iterative method is not based on transformation theory as the most usual KAM theory, but it is based on a novel technique of supplementing the invariance equation with another equation that factors the linearization of the equilibrium equation. (Received February 02, 2015)