Interaction of a discrete soliton with a surface mode

Molina,

We examine the formation of bound state(s) near the surface of a semi-infinite tight-binding chain, when both, a linear surface mode and a nonlinear impurity located at distance d from the surface, are present. By using the formalism of lattice Green functions, we obtain an exact equation for the allowed bound states, and find that in general, up to five bound states are possible, although not all of them are stable. The presence of a surface mode can alter considerably the critical nonlinearity needed to form a bound state on the nonlinear impurity site, when the impurity is close to the surface. When the surface state is "on," interference effects between its tail and the discrete soliton tail can lead to a destabilization of the latter.