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Surface states associated with large scale defects in solid matter.

Abstract. We consider a simple quantum mechanical model in $\mathbf{R}^2$ for a grain boundary in a crystal or an alloy. Here the potential $V = V(x, y)$ is derived from two periodic potentials V_1 and V_2 on $\mathbf{R}^2$ by setting $V(x, y) := V_1(x, y)$, for $x > 0$, and $V(x, y) := V_2(x, y)$, for $x < 0$. We assume that there is a (non-trivial) interval (a, b) which is free of spectrum of the periodic Schrödinger operators $H_1 = -\Delta + V_1$ and $H_2 = -\Delta + V_2$, both acting in $L_2(\mathbf{R}^2)$. We are then interested in the spectrum of $H = -\Delta + V$ inside (a, b). Special attention is given to the cases where V_2 is obtained from V_1 by a translation or by a rotation. We also study related problems on an infinite strip $\mathbf{R} \times (0, 1) \subset \mathbf{R}^2$ where the potentials V_1 and V_2 are not necessarily assumed to be periodic.

This is joint work with M. Kohlmann, M. Stautz, and J. Voigt.