

Übungen zur Oberflächenphysik 8

21. April 2008

1) Random-walk diffusion of Ag atoms occurs over the Si(111) $\sqrt{3} \times \sqrt{3}$ -Ag surface. Estimate the mean displacement of the atom in a time of 1 s, 1 min, and 1 hour at 450 °C. $D_0 = 10^{-3} \text{ cm}^2\text{s}^{-1}$, $E_{diff} = 0.33 \text{ eV}$.

2) The hopping rate of a nitrogen atom on the Fe(100) surface is 10^{-3} s^{-1} at 300 K and $3 \times 10^{-2} \text{ s}^{-1}$ at 330 K. Estimate the diffusion coefficient and calculate the activation energy. Take into account that Fe is a bcc crystal with lattice parameter 2.87 Å. Assume the vibration frequency is $\nu_0 = 4.3 \times 10^{12} \text{ s}^{-1}$.

3) After deposition of equal amounts of aluminium at the same deposition rate onto a Si surface, the number density of Al islands was found to be 10^{10} cm^{-2} at 80 °C. Estimate the activation energy for the surface diffusion of Al adatoms.