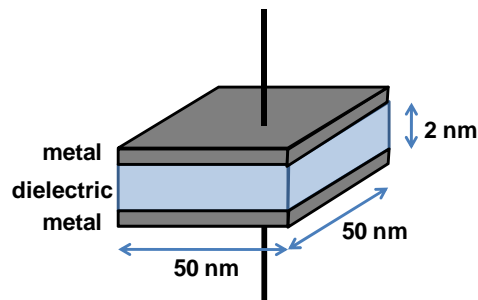Prof. Dr. H. Föll
Chair for general materials science

Exercises "Advanced materials B"

#7

Exercise 7: Non ideal dielectrics

Consider the following capacitor, part of a MOS transistor. 1 V is applied between metal plates.

1. Calculate the field between plates.

2. Calculate the capacitance of the system, considering HfO_2 as dielectric ($\varepsilon_r = 25$).

3. Preserving the same length and width, how thick should be the dielectric layer to obtain the same capacitance as in (2), using SiO_2?

4. Considering a leakage current of 1 mA, calculate the current density.

5. Calculate the parallel resistance of the capacitor.

6. When a sinusoidal voltage signal of 0.1V and 1 Hz is applied to the capacitor (using HfO_2), how large is the phase shift between voltage and current? Consider the parallel resistance calculated in 5.