Gruppe: FP 1 - Sara Buhigas Torres, Annika Meyer, Isabell Suchy
17.06.2025 Scanning tunneling microscopy

1. preparation (done by tutor)
   - new tip, adjusted until length was fitting in experimental set up
   - approach of tip with motor

2. scanning different areas of the sample: graphite
   - PID unit: P = 0,12, I = 0,06 ; tunneling current: I_t
   - choosing new area with cross section
   - aim: get images with 20-30 clearly visible step edges for measurements

3. finding a flat surface to get atomic resolution
   - P ≥ 0,12

   1. try: size = 5nm × 5nm
      speed = 4,65 lines/second
      Bias = 100 mV

      → already a very flat surface, just some shadows on the edges

   2. try: size = 3nm × 3nm
      speed = 2,504 lines/second
      Bias = 100 mV

      → from this point we keep this area and change Bias and tunneling current and speed
      → we test different settings and note only changes that lead to better resolution

   the atomic resolution couldn't be reached, the tutor will provide exemplary images

4. optimize 5 images by varying the parameter settings

image	size [nm]	speed [lines/s]	Bias [mV]	set point [nA]	proportional gain
0040	5	0,603	70	5	0,126
0043	25	0,957	70	1	0,145
0045	65	0,904	70	1	0,086
–	75	–	–	–	– not measured
0049	100	0,904	70	1	0,12

Group 8: Timur Çalis, Luisa Jürgens, Fabian Keller 19.11.2025
Tutor: Vibhuti Rai

Preparation:
- sharpen tip by cutting the wire
- clean the graphite sample with tape
- approach the tip first manually, then with a stepper motor

count steps:

PID: P = 0.12 I = 0.06
size: 30 × 30 nm
speed: 0.581 $\frac{lines}{sec}$
Bias: 1000 mV
set point: 1 nA
signal gain: 1
z gain: 1

PI settings:

size: 8 × 8 nm
speed: (i) 0.581 $\frac{lines}{sec}$; (ii) 0.986
bias: 1000 mV
set point: 1 nA
signal gain: 1
z gain: 1

i) P = 0.3 , I = 0.1499 change of the observing position
ii) P = 0.5 , I = 0.2498
iii) P = 0.3 , I = 0.1499
iv) P = 0.1 , I = 0.05
v) P = 0.05 , I = 0.025
vi) P = 0.7 , I = 0.3497
vii) P = 0.02 , I = 0.01

atomic resolution:

size: 3 × 3 nm Atomic resolution couldn't be achieved.
speed: 0.581
PID: P = 0.12 , I = 0.06
signal gain: 1
z gain: 1
bias: -20 - 20 mV
set point: 2 - 8 nA

files: _STM-Labcourse_Ba10/2025-2026_WiSe/G08

Group n°9 : Ilyin Alexander, Schmitz Sophie, Coquart
26/11/2025.

I) Preparation

Before we take the first measures or get the first pictures, we have to prepare the system. The tutor sharps the wire of the STM with cutting tweezers. He wears plastic gloves so that he doesn't damage it or make it dusty. He also cleans the graphite sample with tape.
Then he puts the wire on the STM back. He approaches the tip manually while looking at it on the screen, then when it's close enough, he approaches the tip with a motor to go slowly. When the tip is close enough to the sample, we can take the motor off and start measuring.

II) Find and count steps

We search areas with visible "steps" on it.
We can change the "searching area" by clicking on a new area on the computer with the mouse.
We collect pictures to get ~20 steps to analyze.
We had to change the tip because we couldn't have good picture anymore because of impurity.

III) We focus on step and "play" with I and P.

. For the values of P between 1,5 and 0,5; the results were unusable.

. For a value of P on 0,3 it was already better.

. We went to the value 0,2 and until the value 0,15. As P was decreasing, we could see the step even better.

. We notice as we go further to 0,1 for P that the step becomes again unclear.

. We decide to go again up with P values to 0,12 but that's not better than with 0,15.

IV) Atomic Resolution

. We moved from the "step" to a flat region of the graphite sample. We are trying to get the atomic resolution.

. 1st try : - Bias : 30 - Setpoint : 3 - speed : 0,757.

. ~~2nd try : - Bias : - Setpoint : - speed :~~

↳ could'nt be achieved

files names :

. I → topographie

. ch5 → spannung