Technische Universität Braunschweig

Fraunhofer IST

pvz Zentrum für Pharmaverfahrenstechnik

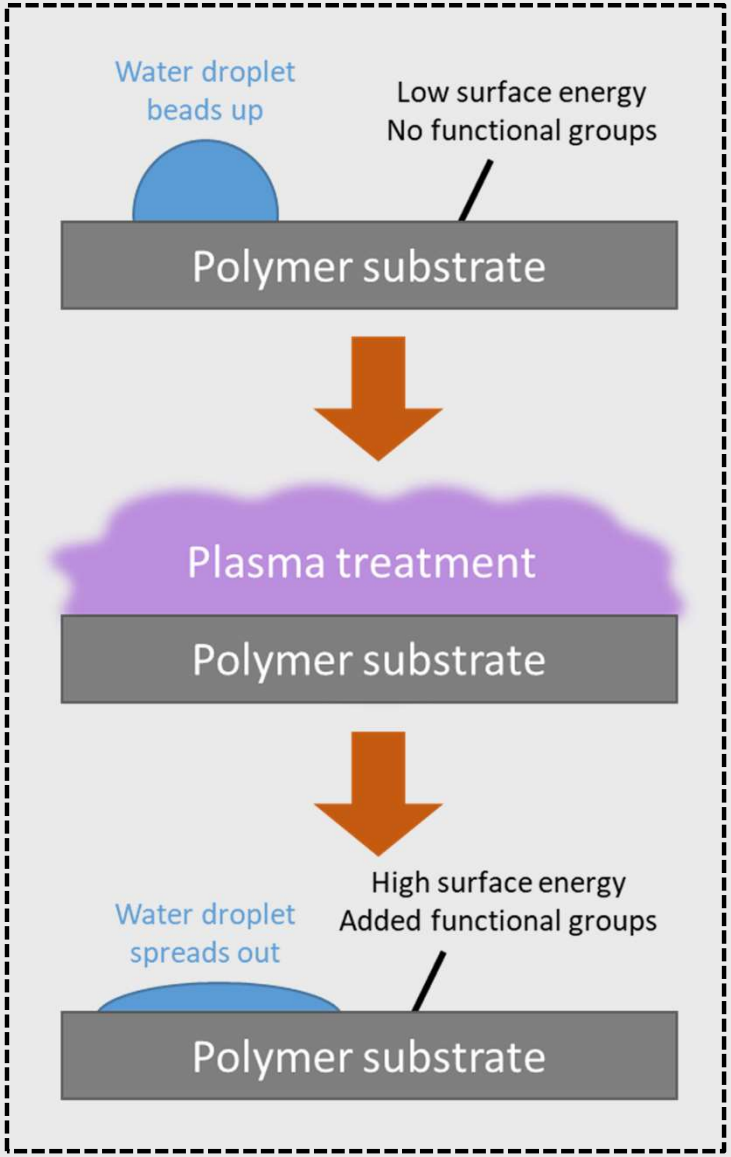
Institut für Mikrotechnik

Master thesis

Layer-by-layer assembly of polymer-based microfluidic systems via plasma processes

Description

As the demand for microfluidic devices grows, developing complex systems in a flexible, cost-effective, and scalable manner gets increasingly critical. A promising approach involves using inexpensive, widely available thermoplastics like polycarbonate (PC), cyclic olefin copolymer (COC), and polymethyl methacrylate (PMMA). While these polymers offer multiple desirable properties, sealing chips made from them remains challenging, often requiring labor-intensive methods (e.g., adhesive bonding) or risking damage to microfluidic features (e.g., thermal bonding). Moreover, scalable production becomes more complex with the addition of functional layers, such as porous membranes needed for on-chip biological interfaces. To address these issues, this thesis explores plasma processes for the bonding thermoplastic polymers. Plasma treatment can enhance surface energy and introduce functional groups, therefore enabling controlled surface modification without compromising microchannels or membranes. This approach might reduce the fabrication complexity, labor, and costs associated with the scalable production of microfluidic systems.



Requirements

- Good English skills, both written and spoken
- Self-structured, disciplined work
- Willingness to travel to Fraunhofer IST regularly

Start: By arrangement

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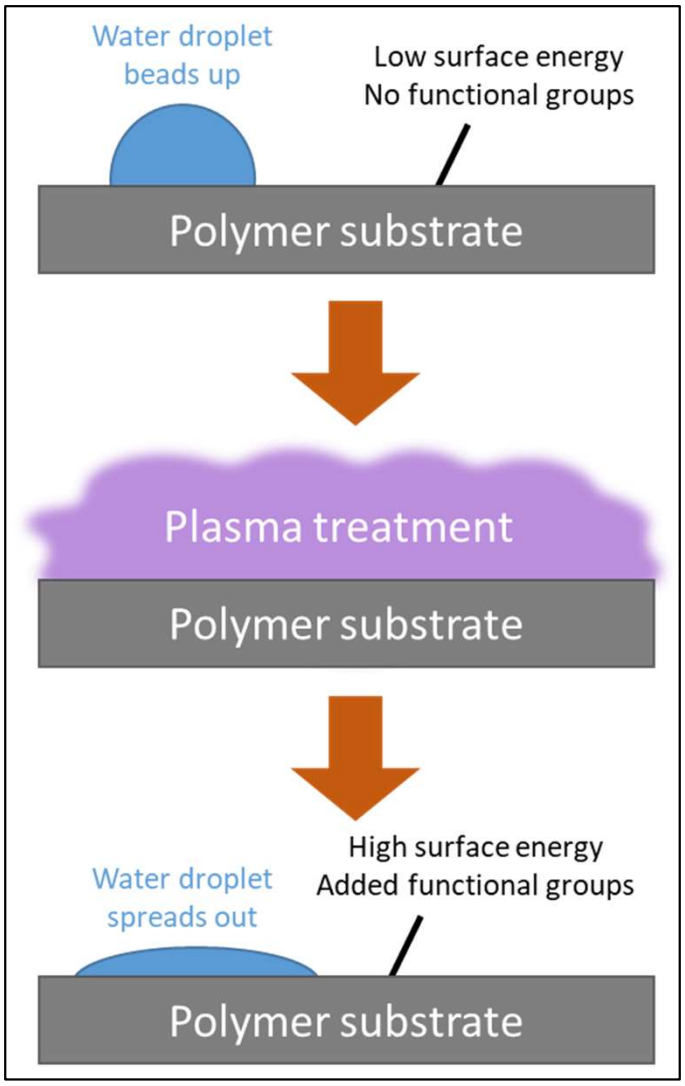
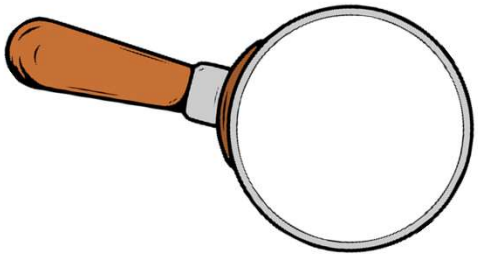
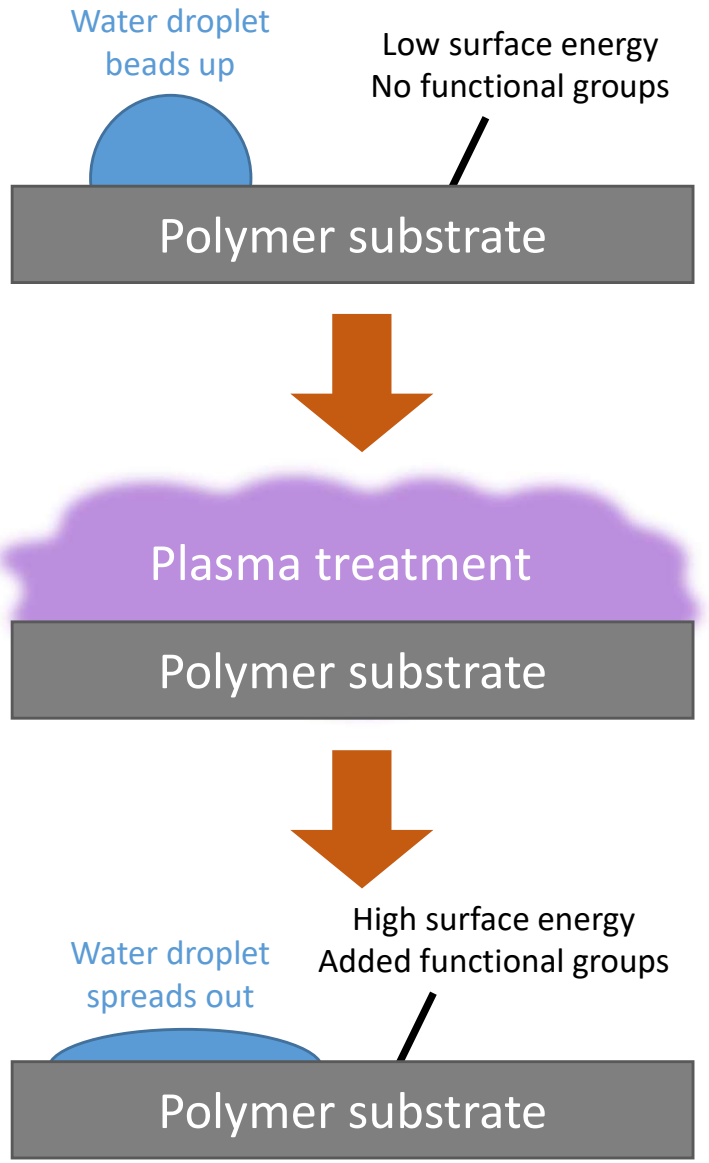
Institute of Microtechnology | Alte Salzdahlumer Str. 203 | 38124 Braunschweig

26.11.2024


Water droplet beads up
Low surface energy
No functional groups
Polymer substrate
Plasma treatment
Polymer substrate
High surface energy
Added functional groups
Water droplet spreads out
Polymer substrate




Water droplet beads up
Low surface energy
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Polymer substrate
High surface energy
Added functional groups
Water droplet spreads out
Polymer substrate

Procedure for publication of the call for thesis

Steps for publication on the institute's website

1. Convert the Power Point to a pdf (see next slides).
2. Export the images from the Power Point slide into an image (e.g. png or jpg) (see next slides).
3. Write a short introductory text for the thesis (max. 2 sentences).
4. If videos are included in the call for thesis, convert the presentation into a video (duration: 30 sec!) (see next slides).
5. Send everything (pdf, video, image and introductory text) to the persons responsible for the website.
6. If desired: Print the call for thesis in DIN-A5 format (see next slides) and hang it on the poster next to the main entrance.

Convert the student call for thesis into pdf

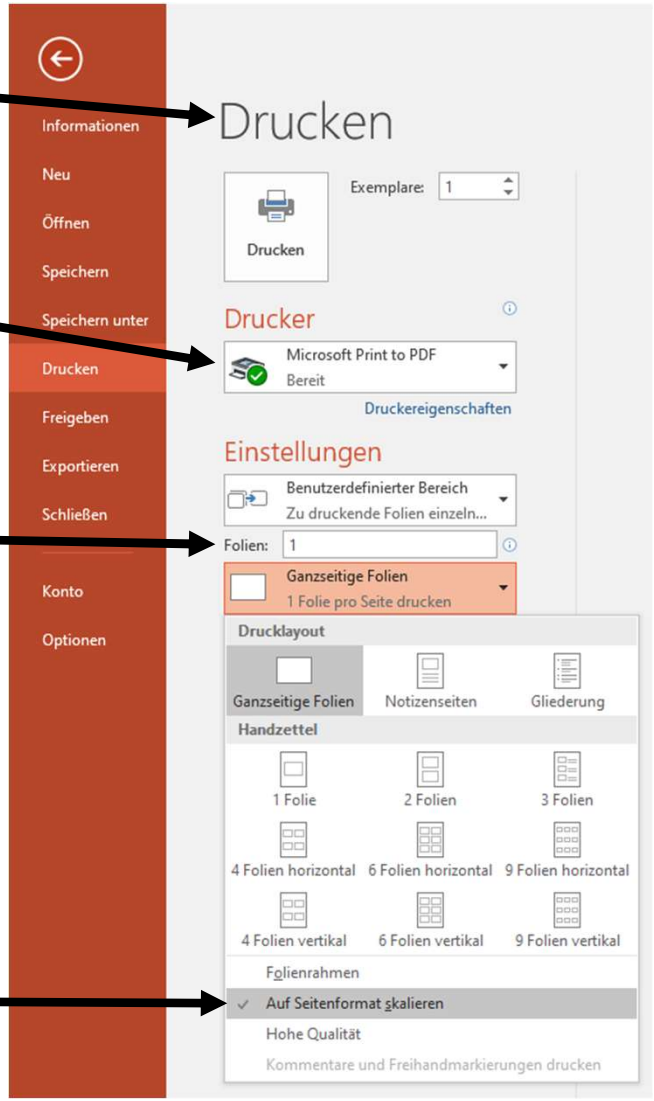
Convert to pdf

Go to print settings

Select "Microsoft Print to PDF"

Print 1st page only

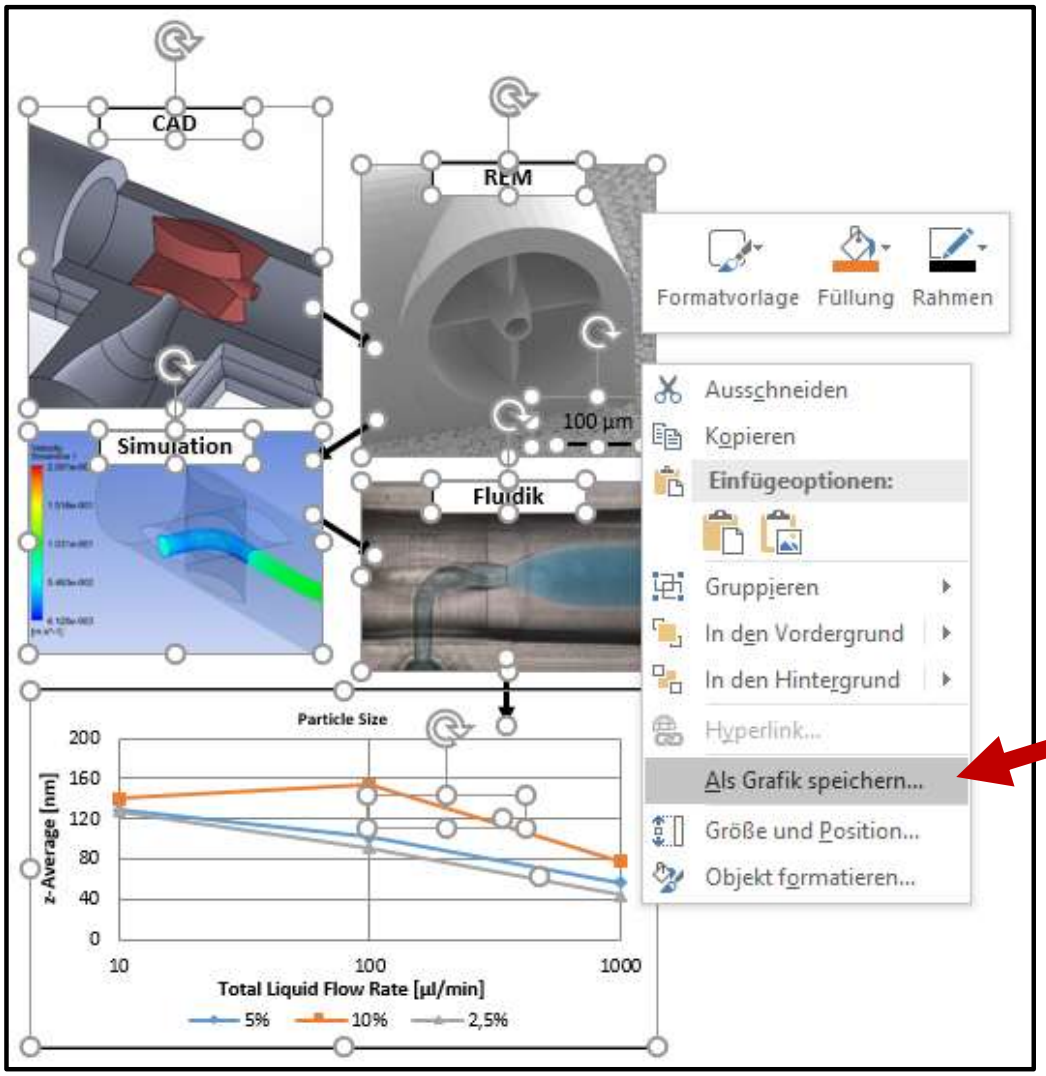
Scale to page format



Export images from Power Point to png

1. Select the images in Power Point
2. Open the context menu
3. Select the "Save as graphic" option

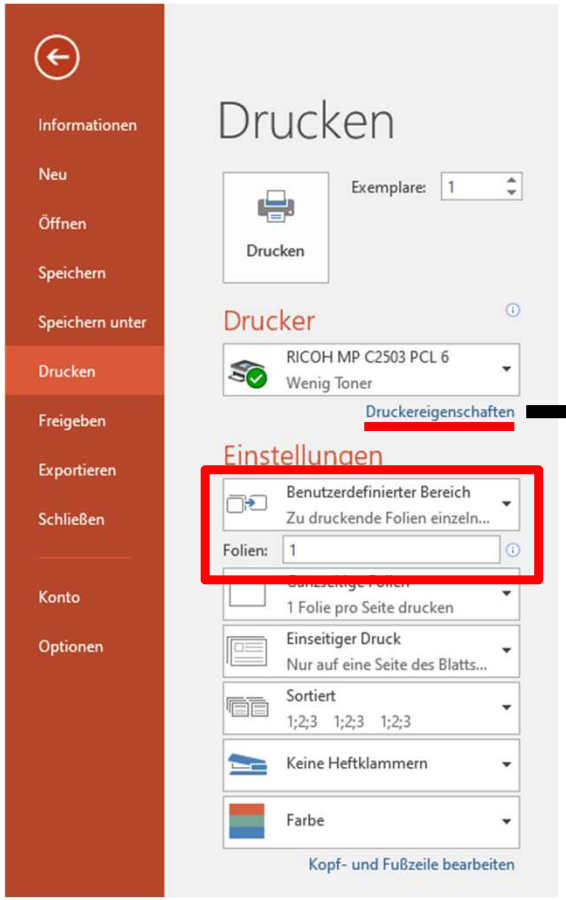
Example



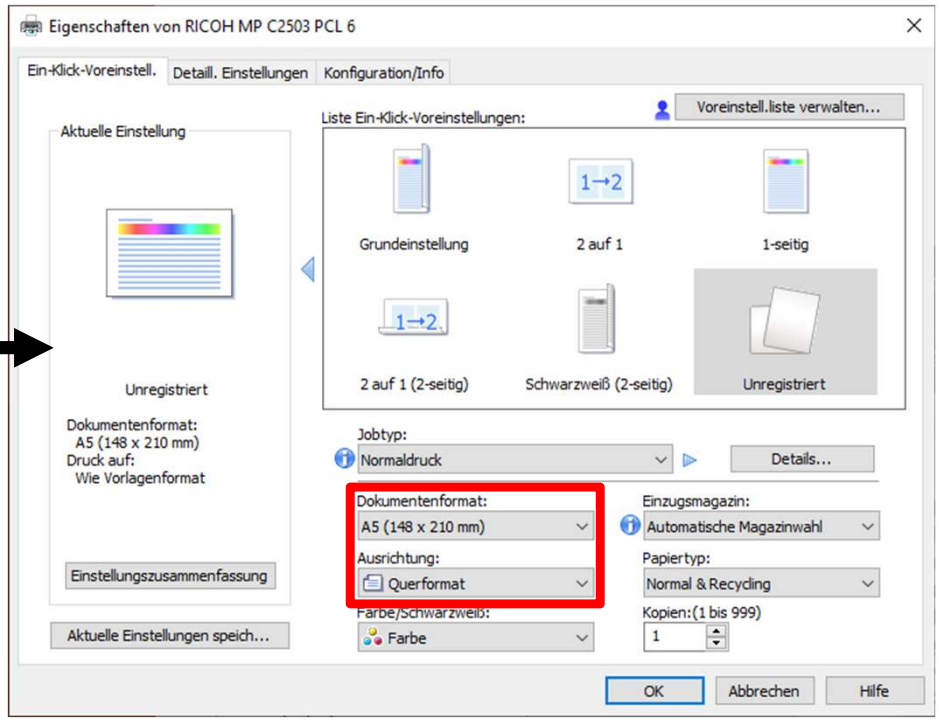
Printing of the student call for thesis

Printing from PowerPoint

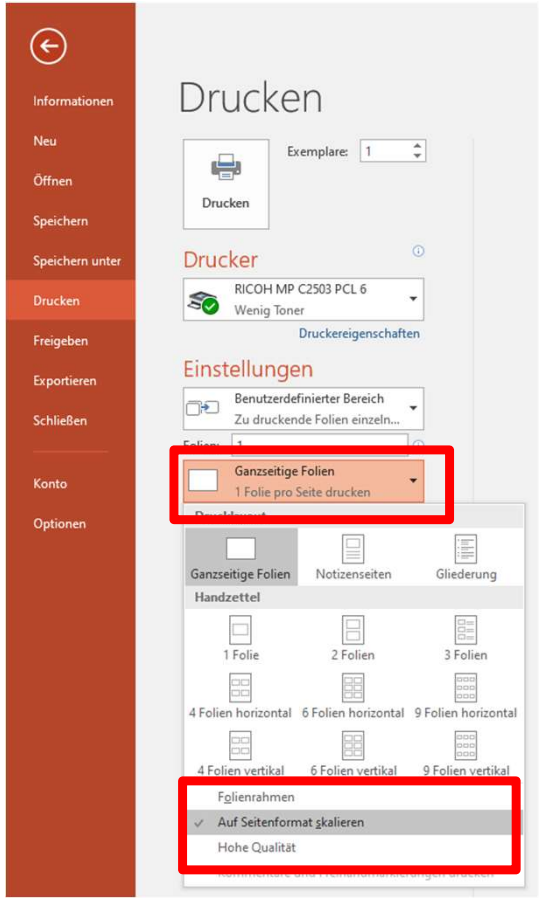
Print 1st page only



Set to DIN-A5 format



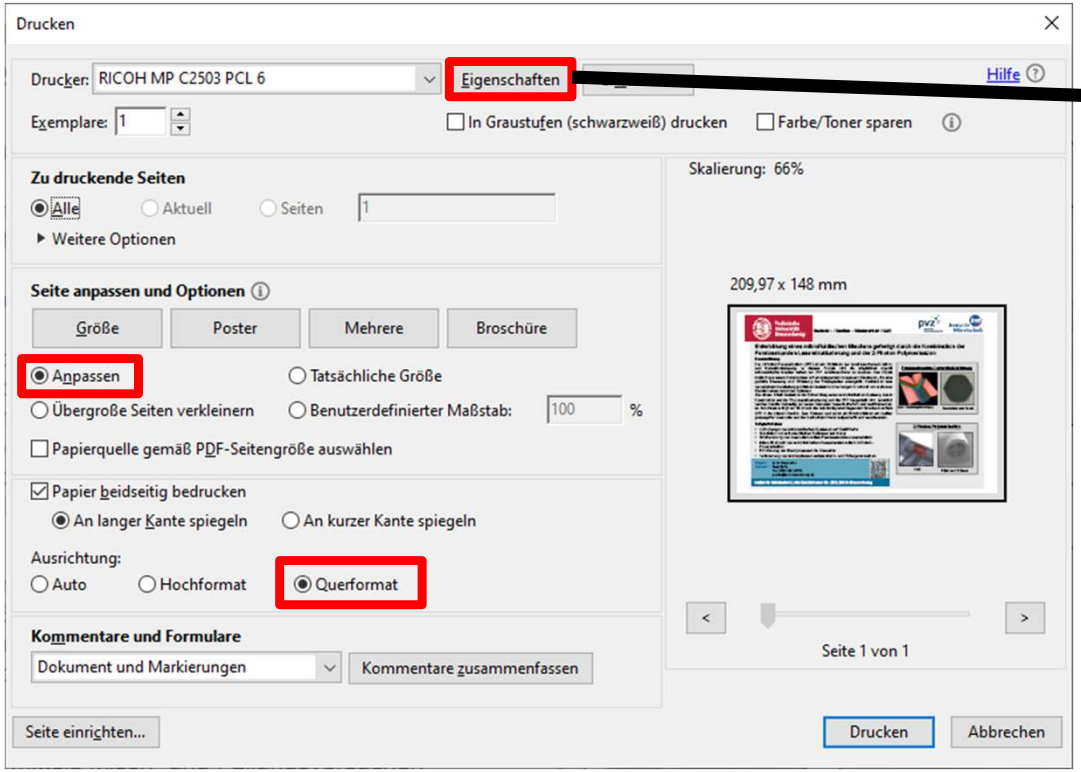
Scale to page format



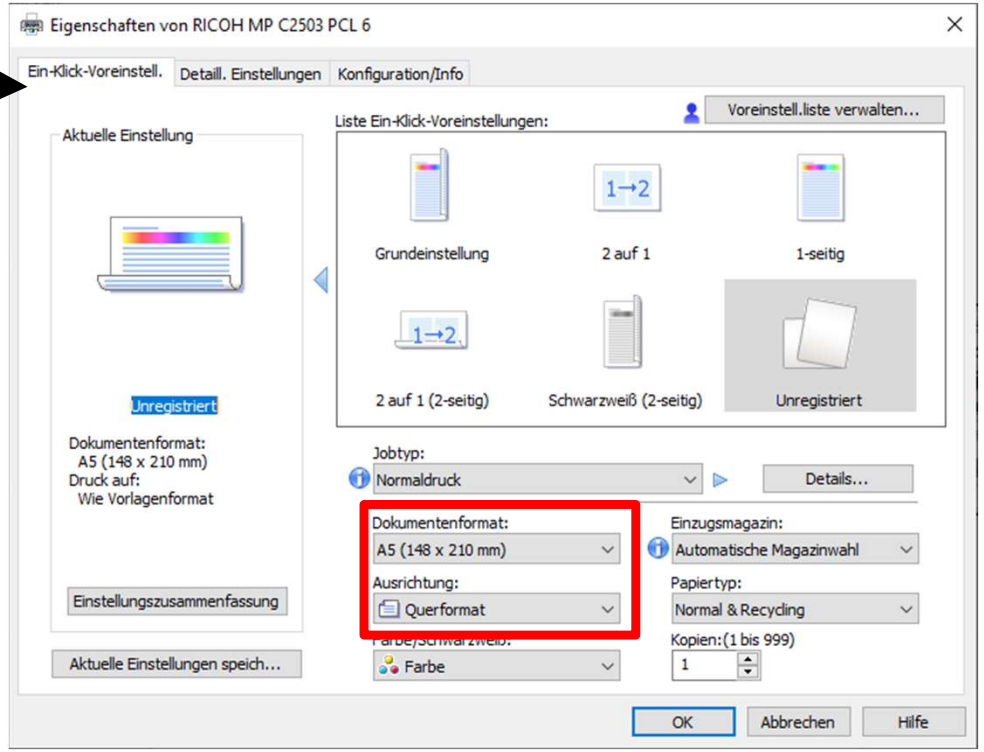
Printing of the student call for thesis

Print from pdf

Adjust slide on page and set to landscape format



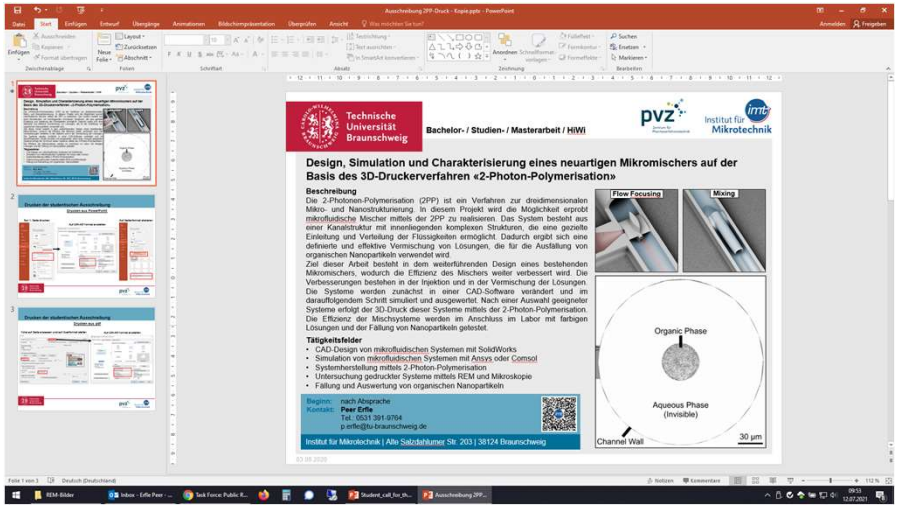
Set to DIN-A5 format



Convert the student call for thesis into a video

- For the conversion you only need Windows 10, which means you don't need to install any other programs.
- **Important!!!:** Your screen must have an aspect ratio of 16:9 or wider (e.g. 21:9). 4:3 or 16:10 is not allowed. The vertical resolution must be 1080.

1.) Finish slide for students

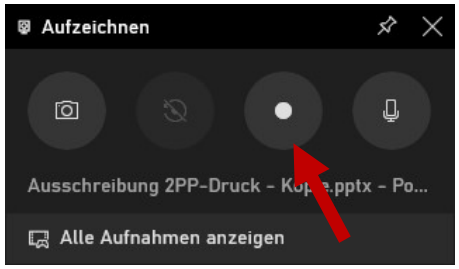


2.) Set the slide to full screen mode (Shift + F5).
(If multiple screens are used, click with the mouse in the screen that should be recorded.

Convert the student call for thesis into a video

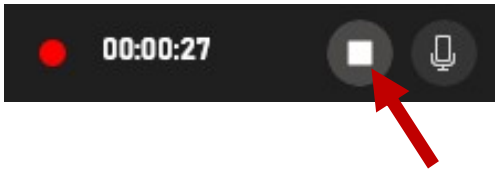
3.) Open Xbox Game Bar with "Win key + G" and start recording the screen. (automatically included in Windows 10)

Alternative: "Win key + Alt + R" starts recording immediately

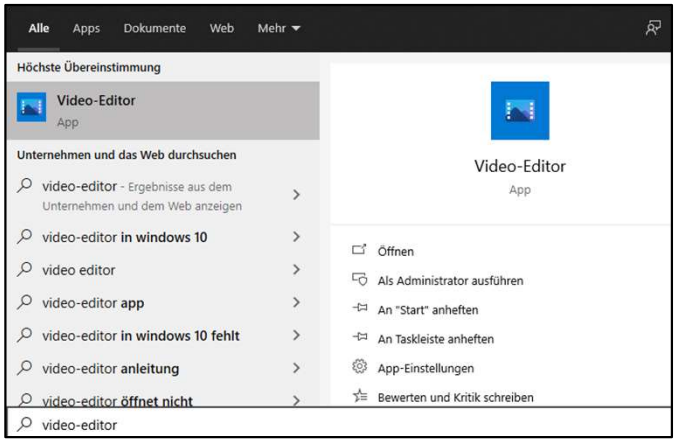


4.) Start animation in slide (move mouse pointer to the side!!!)

5.) Stop recording. The video is located in the "C:\Users*Username*\Videos\Captures" folder.

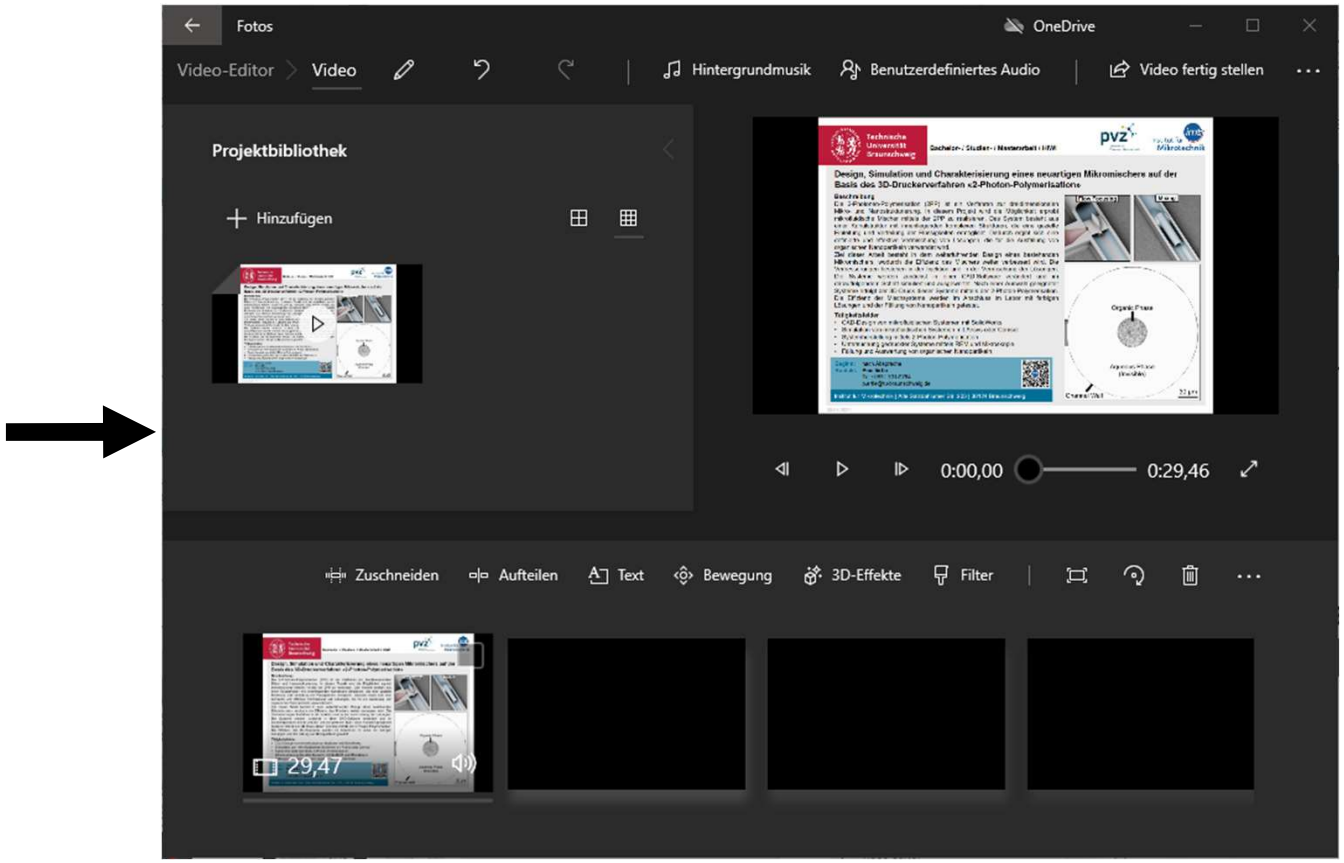


6.) Open the "*Video-Editor*" (automatically included in Windows 10)



Convert the student call for thesis into a video

7.) Use the editor to trim the video so that it has a duration of 30 seconds.



1. Trim the video to correct the beginning (e.g. remove delay or remove visible mouse cursor).
2. Shorten the video to 30 seconds or extend the video by repeating it.
3. **30 seconds is necessary to make it long enough to be seen on the screen in the foyer!**