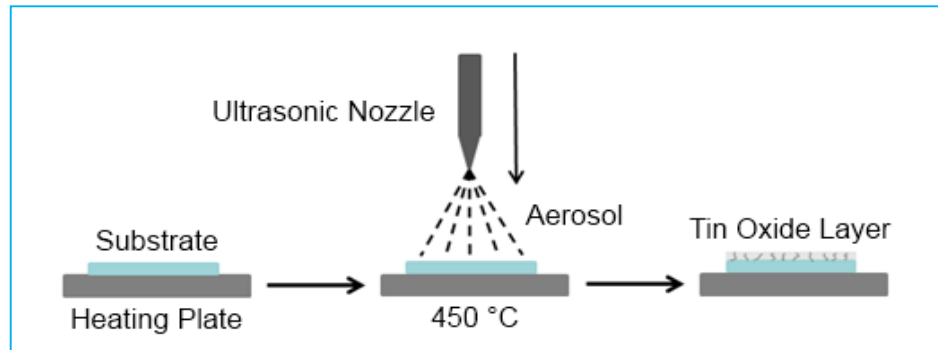


# Ultrasonic spraying for thin coatings

- **Problem:**

The Hannover University located in Germany has a large scientific potential. This is proven by numerous research activities, including those performed at Mr. Fleisch's research institution, the "Institut für Technische Chemie".

Via spray pyrolysis at temperatures around 450 °C conductive transparent tin oxide layers are formed, which are essential in applications like solar cells, optoelectronic devices and gas sensors. A schematic of the ultrasonic spray pyrolysis process is shown in the image below.



The Hannover University contacted SinapTec about a spraying issue at a laboratory scale. Their objective was to spray ethanolic tin solutions to obtain thin coatings of tin oxide on glass sheets and ceramic surfaces with a delivery rate of 1mL/min, for duration of 15 minutes and with a 15 cm range to the glass substrate.

The advantage of the ultrasonic spray pyrolysis over the previously used conventional spray pyrolysis technique is the higher controllability of droplet sizes, as well as a drastic decreased amount of generated overspray solution losses.

## ▪ Solution:

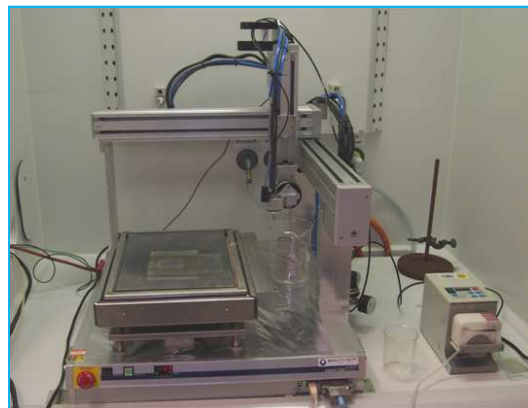
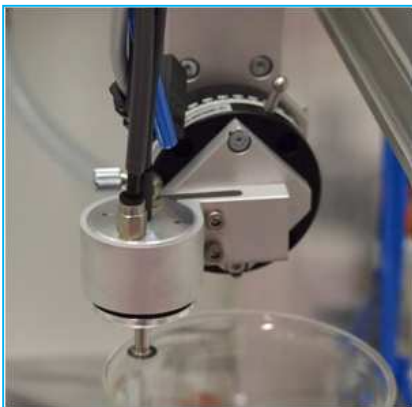
To meet this need, SinapTec supplied a spraying nozzle working on a frequency of 50 kHz and driven by a generator from the NexTgen range itself managed via PC software.

The ultrasonic aerosol produces droplets or particles of controlled particle size: the higher the ultrasonic frequency, the smaller the aerosol droplets (a few  $\mu\text{m}$ ). The liquid circulating via the central orifice in the sonotrode is sprayed as micro-droplets in contact with the vibrating surface. The product to be sprayed is brought through the rear of the nozzle by gravity or via a mini-pump. The aerosol is controlled repetitively by adjusting the ultrasonic power and the flow rate.

This spraying technology has less environmental and economic impact due to its low power consumption, with no need for compressed air for spraying.

## ▪ Results:

Manuel Fleisch, from the Hannover University, has tested the ultrasonic nozzle on laboratory scale and obtained very good results: "The installation of the nozzle went without any problem. Overall we are satisfied with the results and the atomized precursor solutions are working properly."



With SinapTec equipment, he is able to obtain the following results:

- High quality transparent conductive tin oxide layers,
- Highly reproducible layer quality,
- Less precursor consumption due to less overspray,
- No need for the usage of a carrier gas.