Smoothing Station

Florian Reinhard

1 Basic functionality

The *Smoothing Station* is used to smooth the surface of a part made out of polymers by exposing it to a vaporized solvent for a few minutes. To expose the part to a constant atmosphere (i.e. constant temperature, concentration, and pressure), a pump creates a constant flow of vapor around the object. Two valves allow for the pump to change between pumping vaporized solvents or fresh air. This increases the abruptness at which the reaction can be started or stopped.

2 Part list

2.1 High level

- Hot plate and stirrer (closed-loop, up to 100 °C)
- Solvent container
- Pump (chemical grade)
- Transparent sample container (chemical grade)
- PTFE tubing ($\approx$ 2.5m)
- Three-port valve (2x)

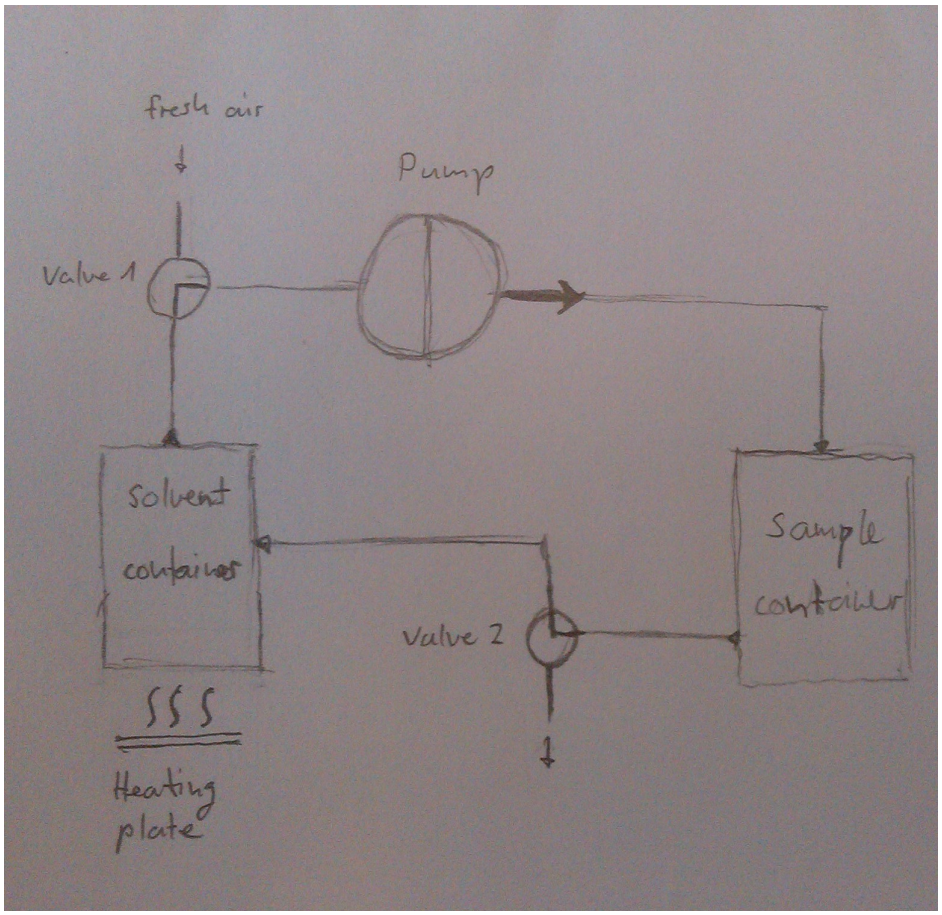

Fig. 1: Schematics of the basic functionality.

3 Critical points

3.1 Mechanical

Sample holder The sample needs to be held in the vapor stream. The sample holder should at the same time

- keep the sample in place
- touch the sample the least possible
- not disturb the vapor stream
- prevent the accumulation of condensed solvent around the sample
- not leave deep marks on the sample surface.

A possible solution is a fine wire mesh, placed a couple of centimeters above the bottom of the sample container.

Sample container The sample is put in a transparent container, so it can be observed visually during the smoothing process. There are a couple of critical points:

- it should be a simple manipulation to open the container and change the sample
- the *inlet* needs to be placed at the *top* of the container and connected to a tube
- the *outlet* needs to be placed at the *bottom* of the container and connected to a tube
- the vapor stream shouldn't be pointed directly at the sample to ensure a homogeneous smoothing of the surface
- condensed solvent should be collected in a controlled manner

Solvent container The solvent is being vaporized on a hotplate and stirred at the same time for better control and thus should be put in a suitable container, e.g. a conical flask. While there's an outlet for the produced vapor, there's also an inlet for the used vapor coming back from the *sample container*. These two ports shouldn't be placed next to each other, to ensure a constant temperature and concentration for the vapor leaving the container. A possible solution is adding a tube to the *inlet* going all the way down into the liquid solvent at the bottom.