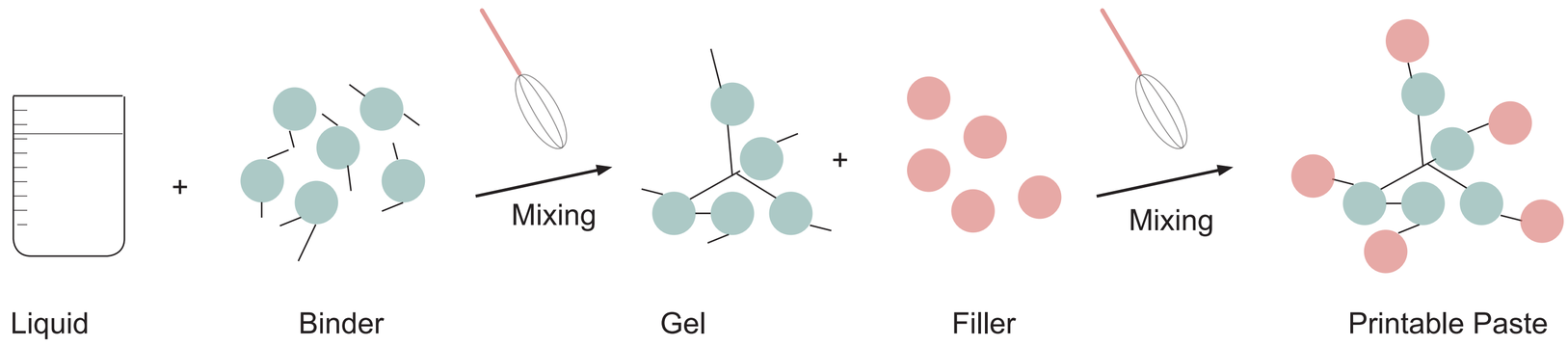
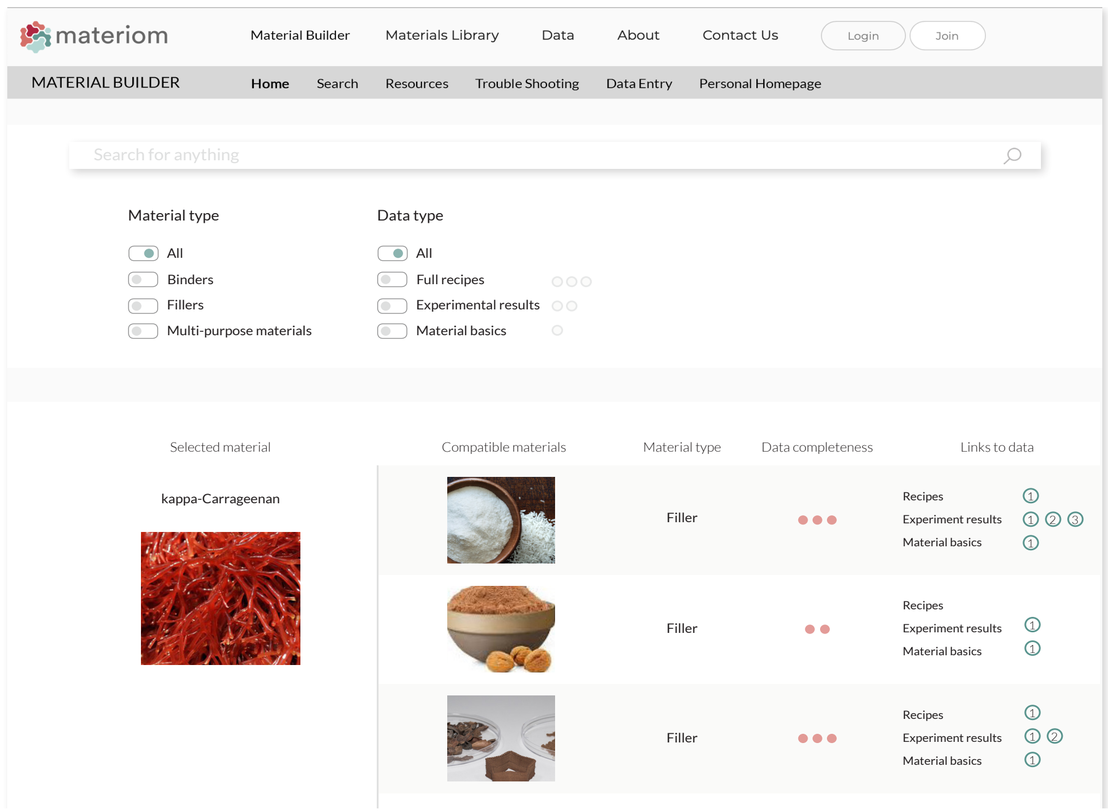
3D Printing with bio-based Materials

Designing a toolkit to guide makers into sustainable material development



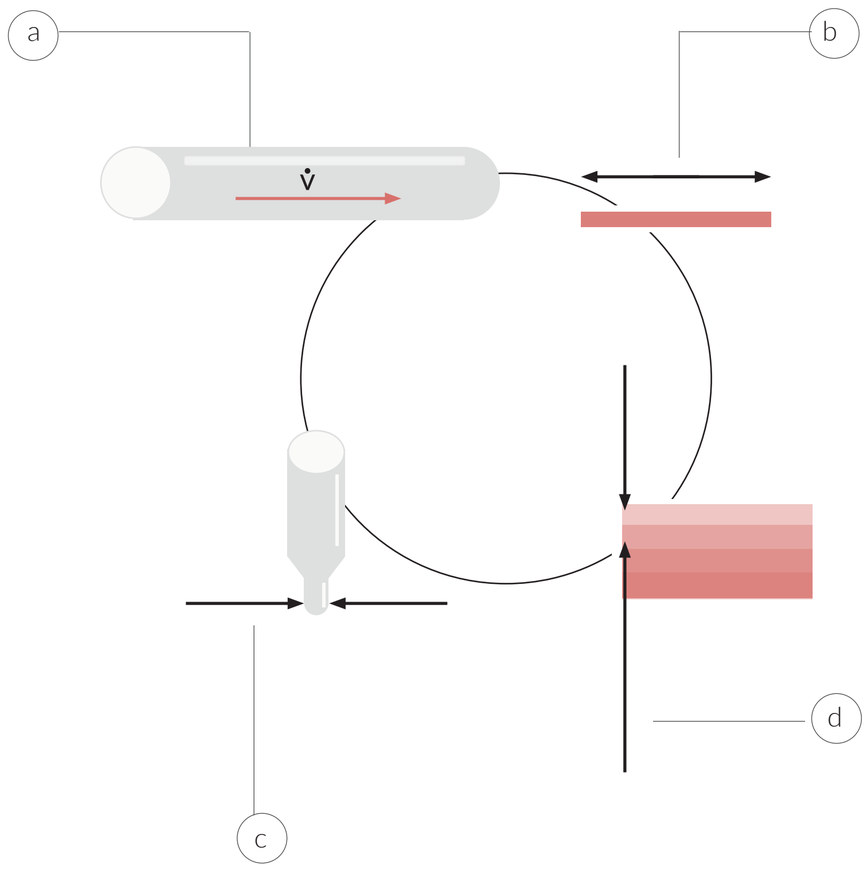
There are many different options to create a printable material, this section focuses on composite pastes that primarily use a gelling agent for the cohesion of the mix. In this case first a gel is prepared from a binder material in combination with a liquid - mostly water. These ingredients are mixed until a homogenous gel is formed. Next, a filler material that is responsible for the structural rigidity after drying is added and again mixed until a homogenous composite paste. Suitable pastes are structured enough to carry their own weight and liquid enough to be extruded through a small nozzle. Ideally their behaviour is opposite of that of a cornstarch bath, such that they flow more easily if a pressure is applied to them.

Material combinations that work well together for the aforementioned standard recipe can be found in the component matcher. From here the corresponding experiment results can be retrieved. When available, complete recipes for the selected material combination can be viewed



mass flow rate

The volume flow rate is a setting in the printer setup. Sometimes it can be controlled directly with a numerical input, but it can also be a function of pressure or an unknown value entered through a pot meter. In those last two cases it is possible to measure the volume flow by letting the machine extrude for a minute and calculate the corresponding average flow per second.



print head speed

The print head speed is a setting that can be found/set in the slicing software that is used to prepare a file that can be read by the 3D printer. It can be the case that the software automatically generates a value, overwride this function and start somewhere in the range of 6 mm/s for a tip size of 1.5 mm

nozzle size

Depending on the printer setup the nozzle size can be selected from the nozzles that come with the printer or, in case of using syringes, luer lock nozzles can be used.

layer height

Like the print head speed the, the layer height can be chosen in the slicing software. As a general rule of thumb one can say: layer height =0.8 • nozzle size

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Integrated Product Design

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