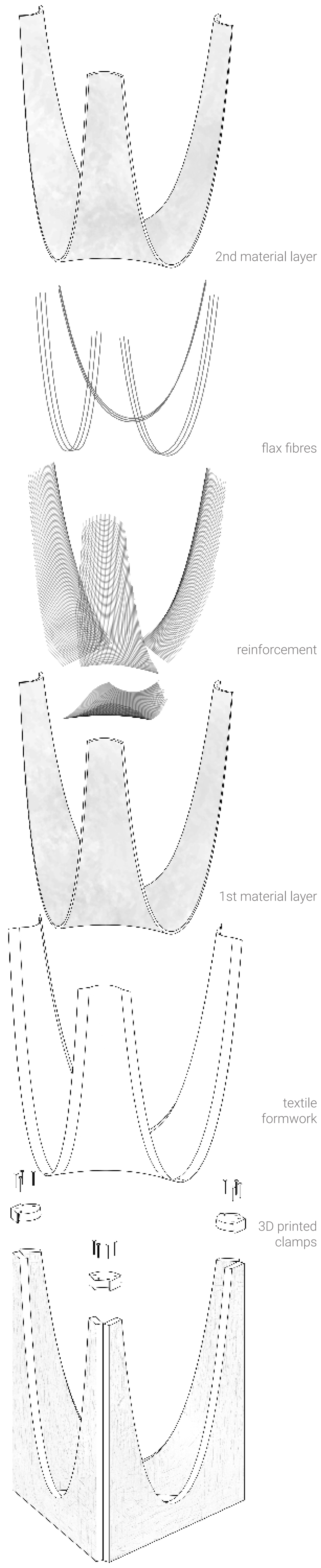
MK749

While the principle of this procedure stays relatively simple, the process is actually quite complicated. It is uncertain if it could work or not since the material wasn't undertaken any long-term tests, but there is definitely a lot of potential of MgO taking up atmospheric CO2.
The second mineral needed for MOC, magnesium chloride, is naturally found in nature as bischofit (MgCl2 x 6H2O) or in seawater. It is hygroscopic and depending on the way of production there are various degrees of purity. MOC cement isn't suitable for steel reinforcements, but for newer types of reinforcement, such as fiberglass or natural fibers, because it bonds very well with them.
Currently, the raw materials for MOC cement are more expensive than those for conventional cement. In the long term the extraction of raw materials from sea water could be a good source, also in order not to remain/be dependent on finite resources from quarries.

Regarding the desirable properties of a chair, which should be usable, durable, lightweight and somehow also nice to be touched, we decided to use sawdust as a filler. Some simple properties tests showed it's definitely not left behind by sand concerning the strength. The sawdust is sieved to make the material smoother and suitable for applying it onto the formwork.
For upscaling a structure built with MOC, especially the weather resistance should be considered. Our test showed that sawdust has a negative effect on the resistancy to water because it is soaking it up over time.

The shape of the chair is a 1.2 cm thick shell, generated by 3 curves on the ground, 3 curves on the side and 3 curves on top controlling the size of thesitting area. While being very light and material efficient, double curved surfaces are one of the strongest geometries in nature. Like for example, egg shells.
To test different variations of the geometry and to be sustainable in the design process in which the shape and the thickness of the shell would change, a parametric model 3D model (Rhino/grasshopper) was used.This also enabled a structural optimization concerning the forces inside the shell.
In general, double curved surfaces are very hard to produce and need a lot of material for the formwork. Using textiles is simplifying the process.
The formwork is made out of a jute fabric, clamped into a simple wooden frame made out of three planar sheets.
Using a close mesh weave prevents the material from pushing through the fabric. Because of its rough surface it provides enough grip for the vertical application of the material.
For the reinforcement a loose mesh weave also made out of jute fabric was used. Small gaps in between the mesh are insuring a proper connection with the material on the opposite site of the reinforcement layer, as it is applied in the center of the intersection of the shell. In higher stressed areas of the shell such as the outer edges and as some kind of „connection" in between the 3 legs we additionally applied some individual flax fibres.

The final chair can be cut out of the frame after around 10h of curing time. It weighs around 4.2kg and is able to support a person.



The material was applied by hand on the textile formwork.

Comparison of a 3D scan of the finished prototype and the computer model showing the formwork accuracy.