



MARTIAN BIDESIGN

by Northwestern

PROGRESS UPDATE

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Due to recent work studying the bonding between adjacent layers of our Martian concrete, our team will be looking into reheating a fully cooled previous layer prior to deposition of a second layer as a mechanism for increasing interface strength between layers. This would likely translate to some sort of reheating mechanism preceding the nozzle in the printing head in a final printer design.



Interface Strength.

In order to explore the viability of the Martian concrete as a 3D printed material, a group from Northwestern's Design Thinking and Communication course has conducted testing to quantify the bond strength at the interface between two layers of the Martian concrete. Their research, though preliminary, has indicated that new layers of concrete do not bind well to previous layers that have fully cooled. Alternatively, this interface weakness can be lessened if the previous layer is still relatively hot (~110°C in their procedure) when the next layer is laid. Two members of that group are working with our team over the summer to continue their work on this project.

Another research priority at the moment is the extrudability of the Martian concrete. In order to be 3D printed, the material must be fluid enough to be pumped through a nozzle but viscous enough to hold its shape once extruded. Our team has begun conducting rheological testing to characterize the viscosity of the Martian concrete so that we may design our printhead accordingly.

Also, we have just received a Noztek Pro High Temperature Extruder meant for melting down plastic pellets or powders at high temperatures and extruding the product as a filament. We plan to use this machine to explore the practical extrudability of our material to determine if a similar but scaled-up design, featuring a screw conveyor moving powdered material through heated coils, would work for our final printhead.

Designing that printing mechanism will soon be our team's highest priority once we complete our research on the material itself.

This month's team fun fact:

Team member Roberto Roches was born in Mexico on the Fourth of July.