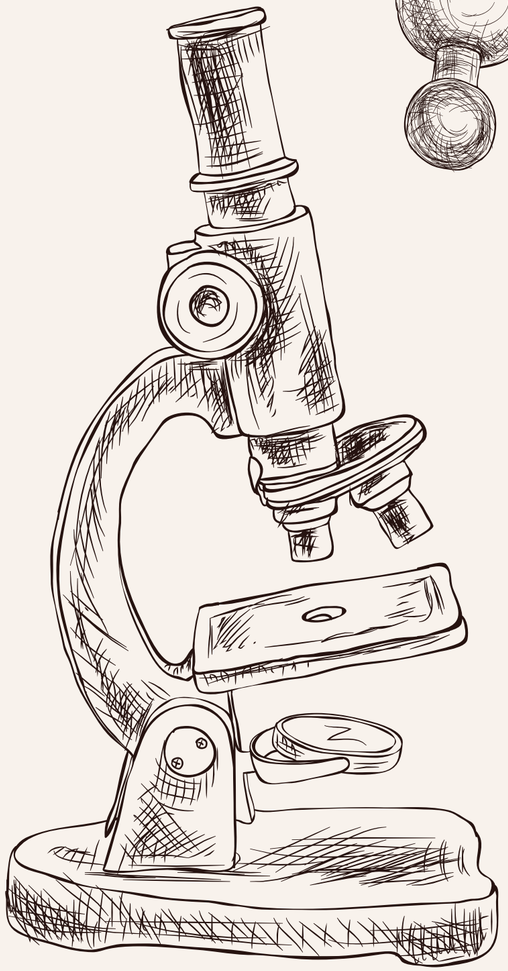
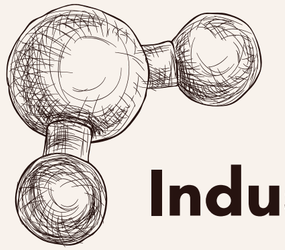
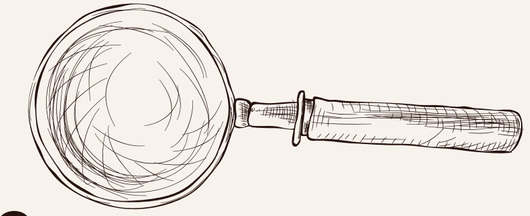
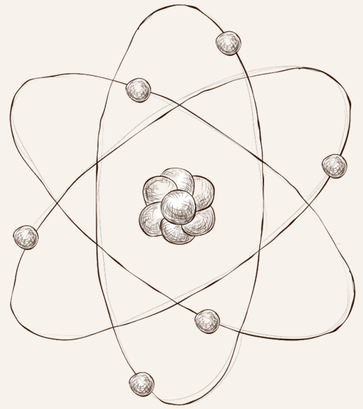




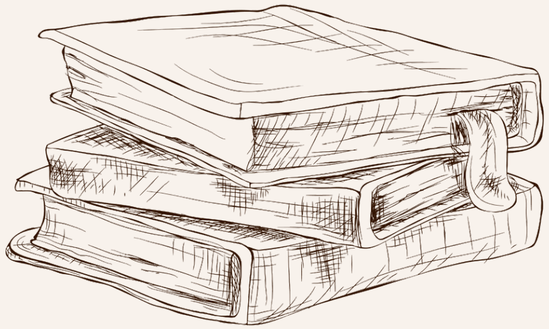
SDG Goal #9

Industry, Innovation & Infrastructure





"INNOVATIVELY OBTAINING AIR-PERMEABLE CONCRETE FROM CHEMICAL WASTES AND USING THEM FOR PHOTOSYNTHETIC HOUSES"



Presented by Jennet Ylyasova

Identification of Research Problem and Scientific Thought for Sustainable Industry Materials

Current concrete requires paramount resources to be made.

Chemical Name	Chemical Formula	Notation	Percent by Weight
Tricalcium Silicate	$3Cao.Sio_2$	C_3S	50
Dicalcium Silicate	$2Cao.Sio_2$	C_2S	25
Tricalcium Aluminate	$3Cao.Al_2O_3$	C_3A	12
Tetracalcium Aluminoferrite	$4Cao.Al_2O_3.Fe_2O_3$	C_4AF	8
Gypsum	$CaSO_4.H_2O$	CSH_2	3.5

1 ton of current concrete is $60-$75 which makes it expensive as an industrial material.

Chemical factories release tons of chemical wastes: phosphogypsum, sulfur slag, and chalk residues to name few.

How can I reuse the industrial waste? Is there a more cost-effective way of obtaining concrete?

Chemical Wastes that are released every year in huge amounts:

Sulfur slag

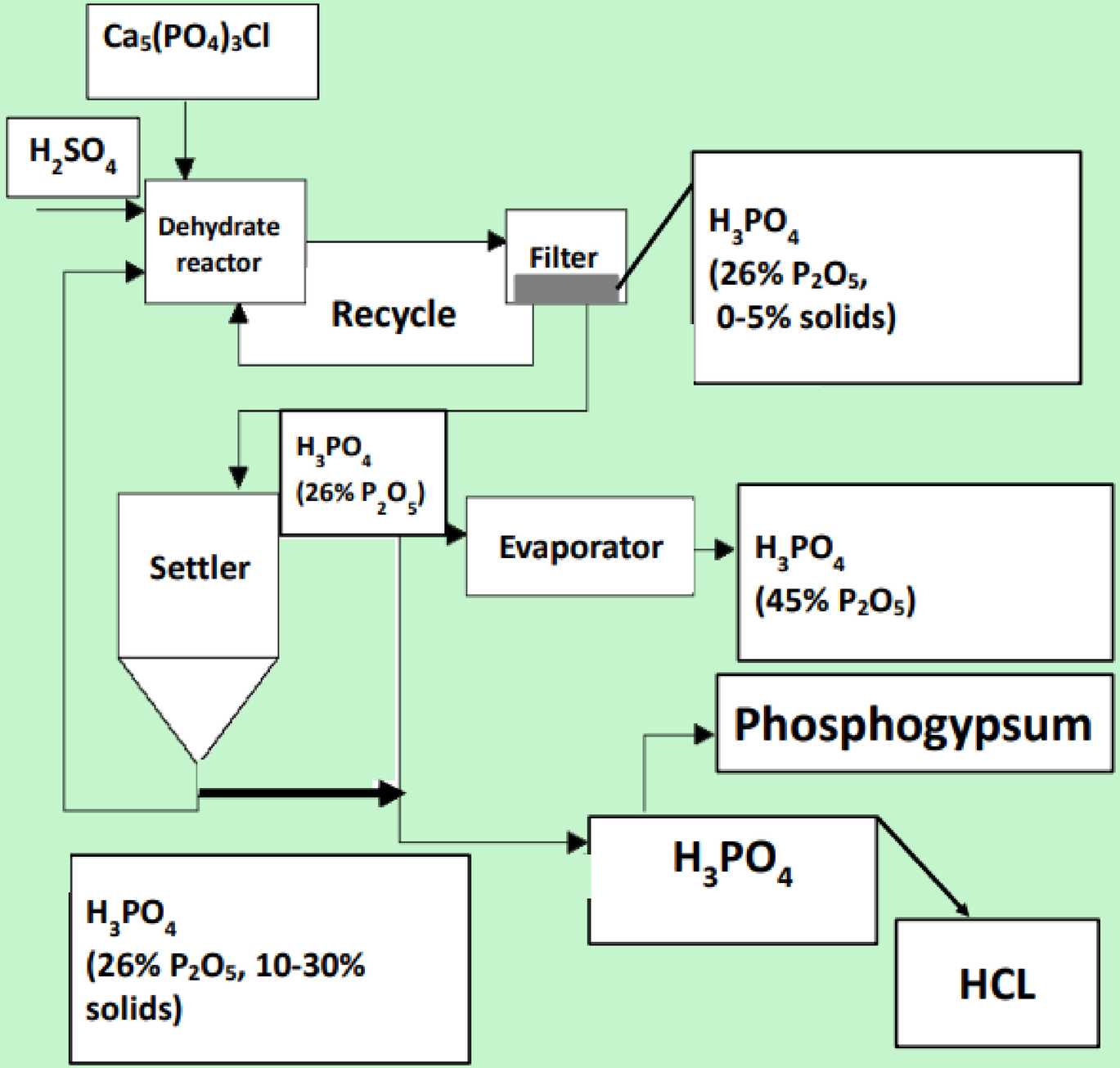
Chalk residue

Phosphogypsum

Sulfur Slag releases Methane when left unused;
#Phosphogypsum releases radon when left unused;
Chalk Residues make the soil unharvetable when left on the ground

Methods

- Comprehensive methodology involving experimentation and data collection.
- Analyses of properties and applications of sulfuric slag, phosphogypsum, and chalk residue.
- Making sure that all lab safety rules are applied and listening to the guidance of my virtual mentor - Dr. Hudaykuly.



Detailed Overview

- To obtain H2SO4, we start with round-shaped sulfur.
- The sulfur is melted, and the liquid sulfur is transported by railways.
- The liquid sulfur is purified from mechanical pollution and filtered.
- After filtering, pure sulfur and sulfur slags are obtained.
- Sulfur is burned, resulting in the production of sulfur dioxide (SO2).
- To obtain pure sulfuric oxide, H2SO4 is used, and sulfur slag is left as a residue.

- **Interesting Note:** When filtering 1 ton of sulfur, approximately 10-15 kg of sulfur slags are obtained. With a production scale of 500 thousand tons, around 7500 tons of sulfur slags are generated annually from one chemical factory. (Arkema Factory)

Results

- Successful development of sulfuric concrete and asphalt coatings using industrial waste.
- Visual representation of data through tables and figures.
- Statistical analyses supporting findings.

Mixture of sulfur slag, chalk residue and phosphogypsum

Results

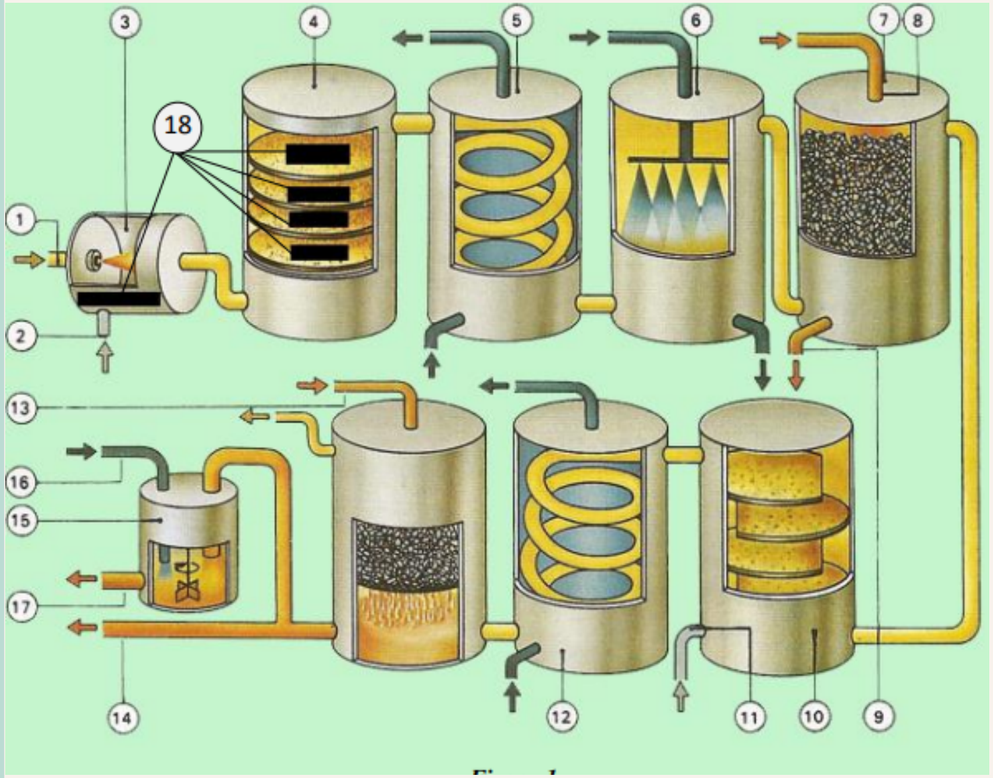
- Our concrete costs $15-$20 per ton, while being made from Chemical Wastes
- There are 13,500 Chemical factories in the US, if each of them were to use their Chemical Wastes to obtain Concrete, they would reduce the gas emissions by %0.3 (each of them) which makes a HUGE Difference.

Result. Our concrete

- Each of the factories can make extra 7 million dollars, if they use their annual chemical waste to prduce concrete
- Concrete that I obtained from Chemical Wastes turned out to be impermeable to water, while being permeable to air which makes it have a longer life while making it the most suitable industry material to build the buildings.

Discussion

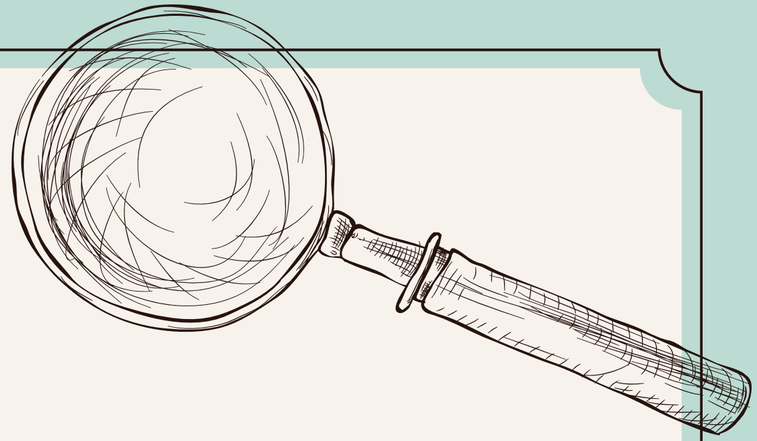
- Promising outcomes in eco-friendly construction practices.
- Comparison with existing literature and expected outcomes.
- Analysis of potential errors and uncontrolled variables.



№	Sulfur slag	Chalk residue	Phosphogypsum
1.	5	15	20
2.	5	10	10
3.	5	10	20
4.	5	20	20
5.	3	10	15

Now using concrete	Our concrete
Expensive than our concrete	Cheaper than now using concrete
Not tolerant in water	Tolerant in water
Soft than our concrete	Very hard
In a producing uses expensive matters	In a producing uses only chemical wastes
Not for coating asphalt or roads	Can use for coating asphalt or roads

Conclusions



01

Contribution to sustainable construction practices.

02

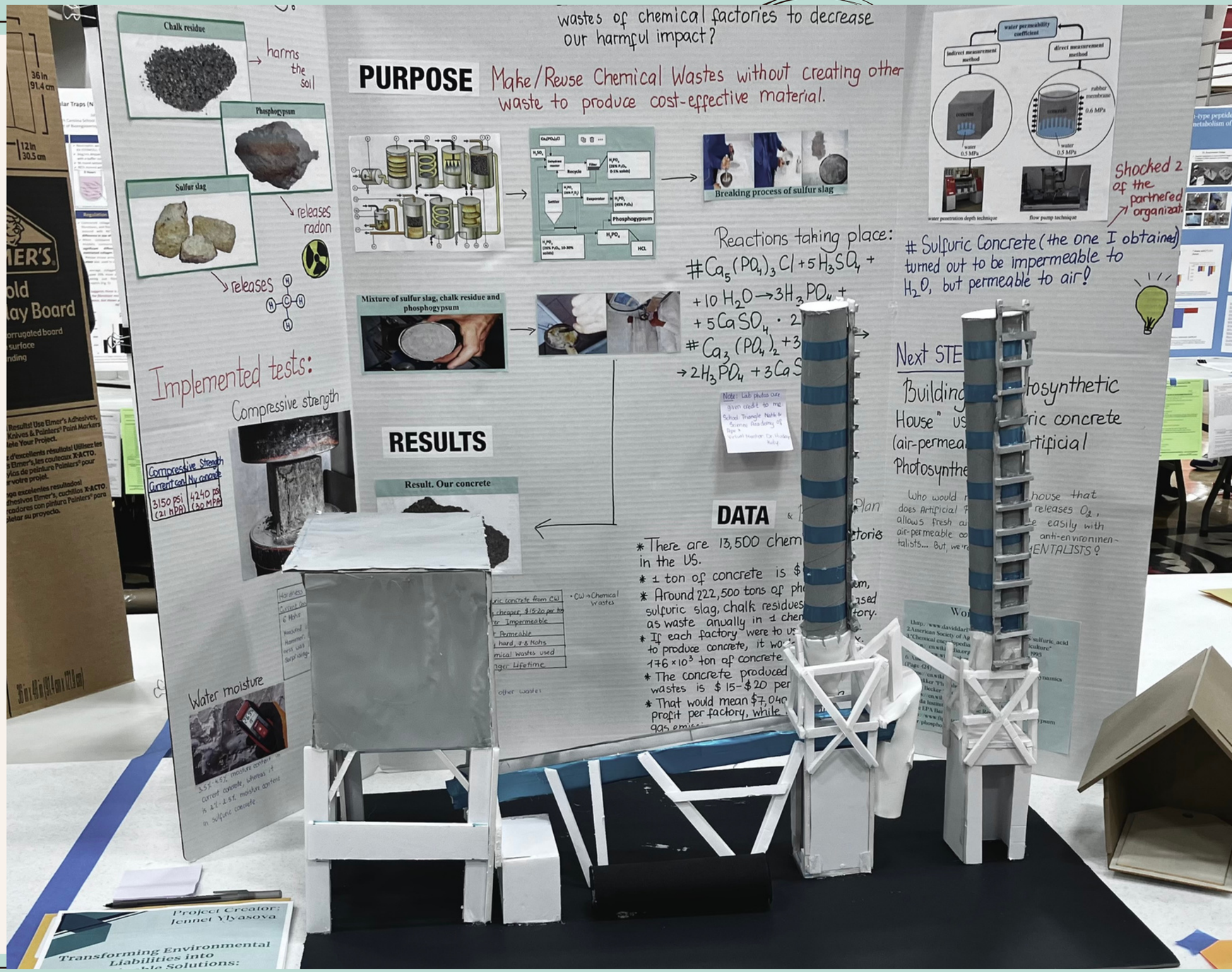
Viability of waste-to-resource approach validated.

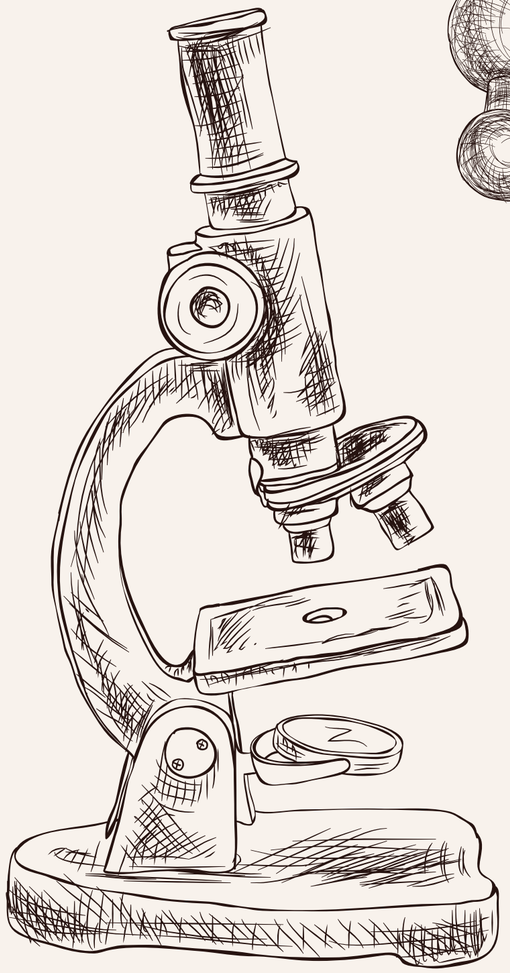
03

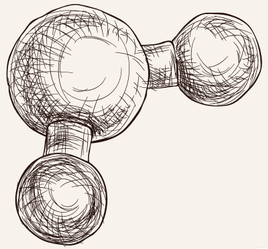
Potential for widespread adoption in construction industry.

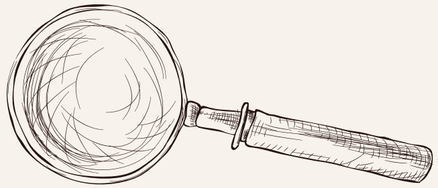
Next Step: Make a Photosynthetic House out of our Air-Permeable Concrete

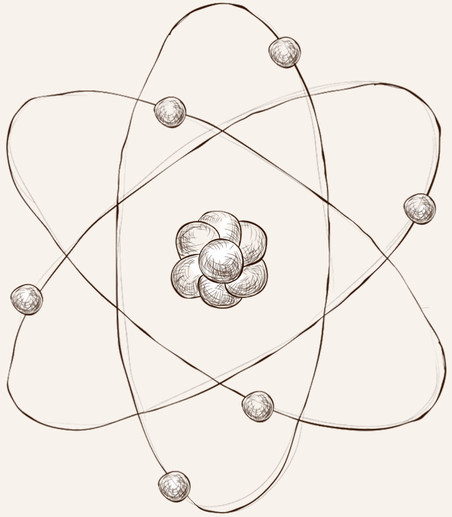
Model of the Implemented Project





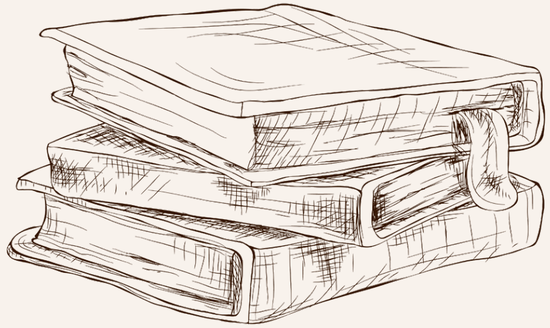






Thank you!

Do you have any questions?



Resource Page

- https://www.daviddarling.info/images3/sulfuric_acid_manufacture.jpg
- http://www.buildingresearch.com.np/services/ct/ct0.php
- "Chemical Encyclopedia." Moscow Print House, 1995.

Communications and Publishing, Science Snippet, “Slag - What is it good for?”, Accessed 11/02/2023 https://www.usgs.gov/news/science-snippet/slag-what-it-good

- A. I. Anselm, “Bases of Statistical Physics and Thermodynamics,” Nauka, Moscow, 1973.
- The rest of the used resources are given credit to me.