

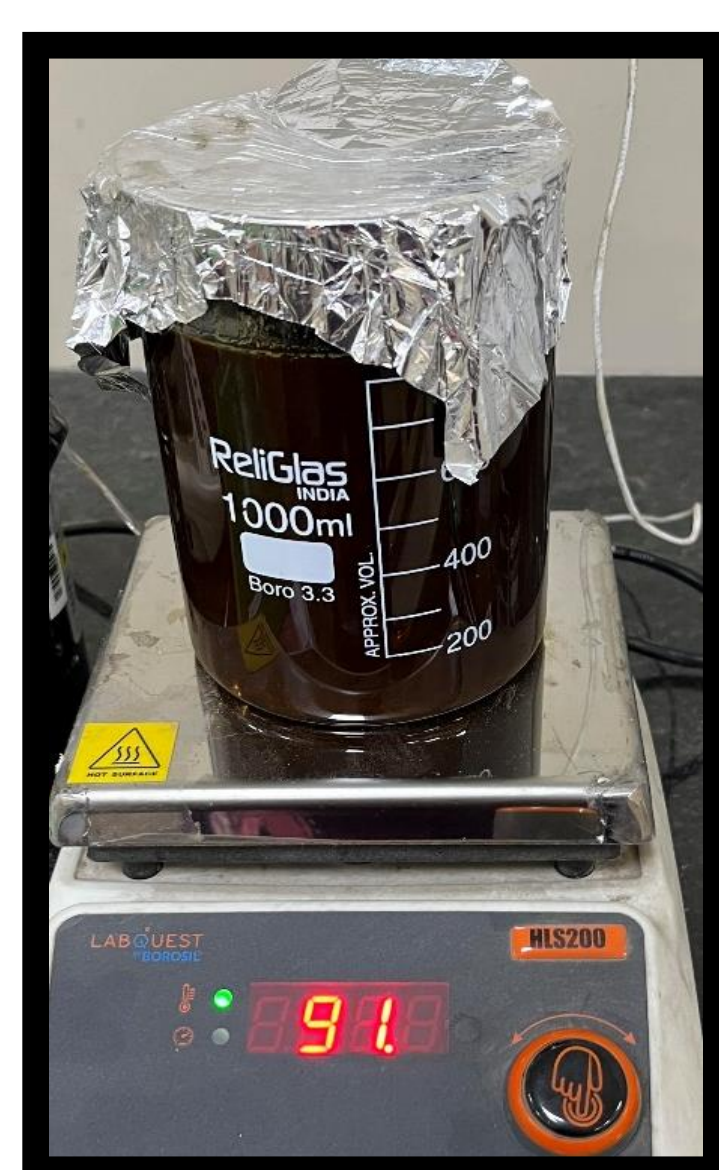
INTRODUCTION

- Rice straw, an agricultural residue, contains silica and lignin.
- Silica has various applications in industries such as construction, electronics, and healthcare, while lignin has potential as a renewable feedstock for biofuels and value-added chemicals.
- Alkali treatment of rice straw with NaOH at elevated temperatures breaks down organic components, enabling the extraction of silica.
- Acid treatment is then used to extract silica and lignin, a complex polymer that provides structural support to plants.

OBJECTIVE

- Removal of silica from rice straw and further use of treated rice straw for bio-fuel production.
- The experiment aims to extract silica from rice straw using alkali treatment and subsequent acid treatment.
- The extraction of silica and lignin will eventually create a good quality bio-fuel.

EXPERIMENTAL SET-UP



NaOH digestion



Vacuum Filtration

Fig. 1 : Experimental Set up of the experiment

PROCESS

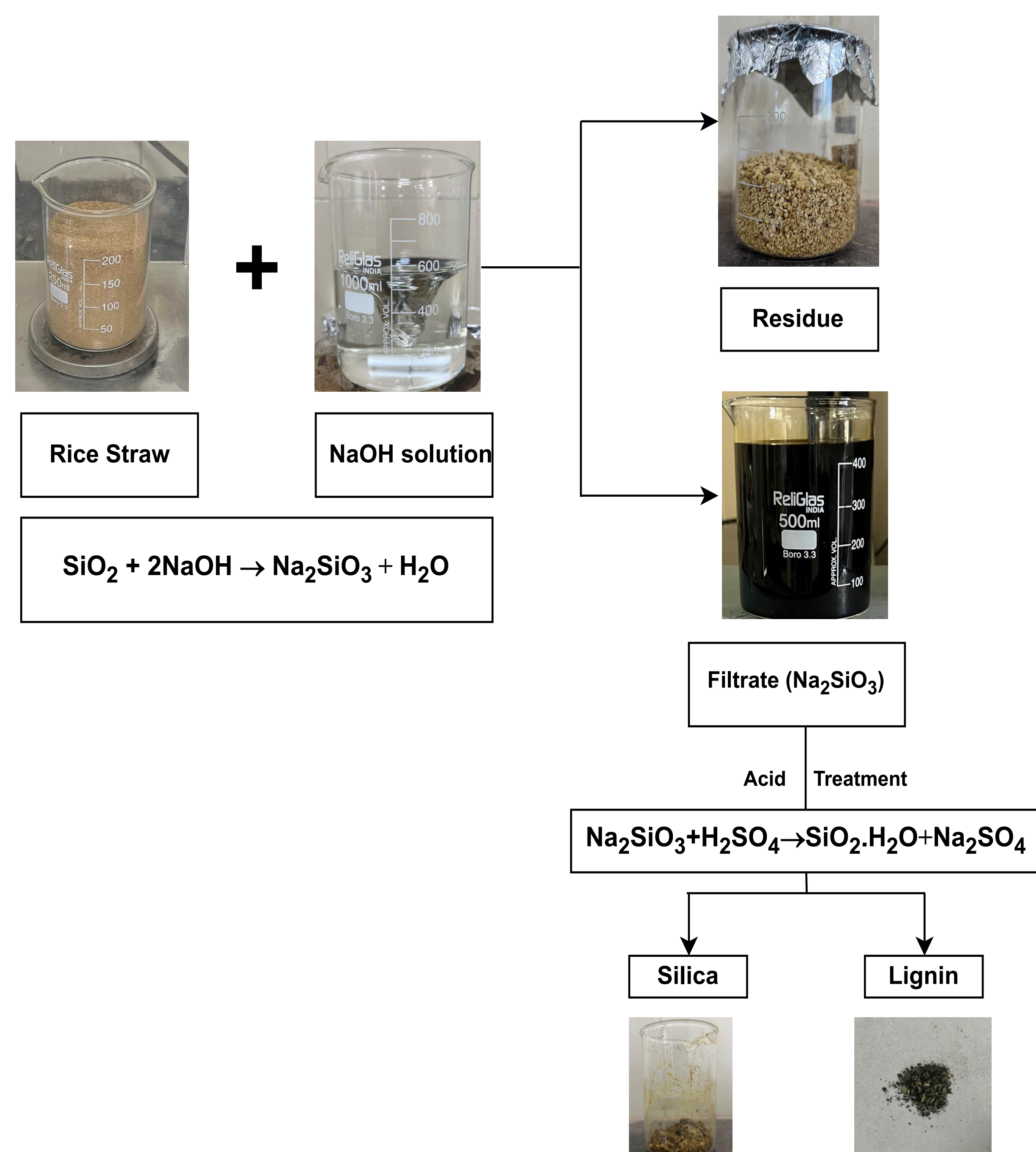


Fig. 2 : Schematic diagram of the process

RESULTS AND DISCUSSION

Experimental product yield-

Silica- 24%
Lignin- 16%
Residue (holocellulose, other organic matter, etc.)- 36%
Other substance in aqueous state- 24%

Raw materials used-

Rice Straw - 50 grams
5% NaOH solution – 750 grams
Solution – 37.522 grams NaOH pellets and 712.5 grams DM water
Ratio of NaOH solution and Rice straw- 15:1

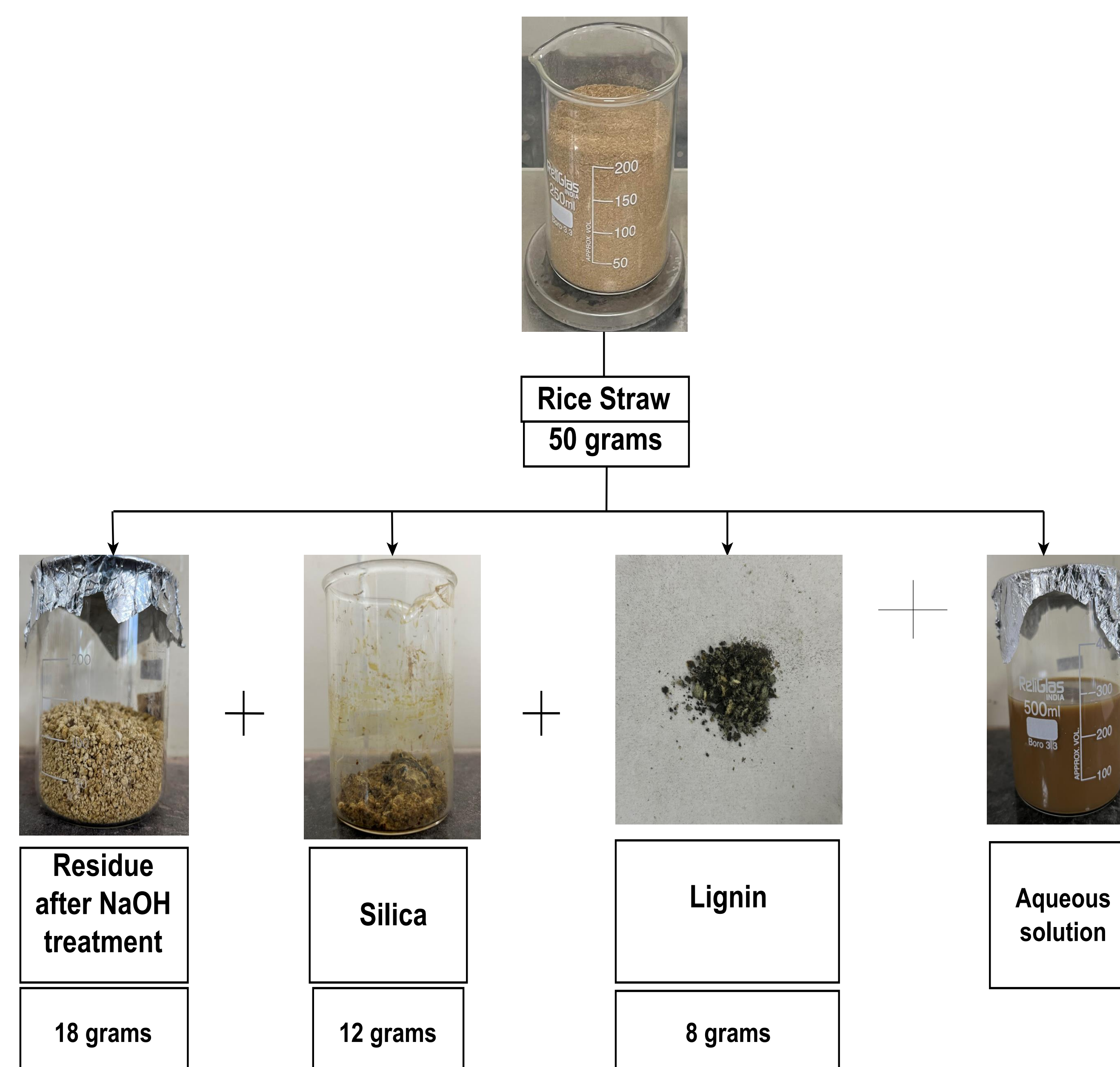


Fig. 3 : Weights of materials used

CHARACTERIZATION

- TGA – Thermogravimetric Analysis for analyzing the ash content
- XRF – X-Ray Fluorescence for elemental analysis of materials
- SEM – Scanning Electron Microscopy for visualizing the surface morphology and particle size
- FTIR – Fourier Transform Infrared Spectroscopy to check the functional bands
- CHNS Analysis – Elemental composition of our sample

CONCLUSION

- The experiment demonstrated the effective extraction of silica and lignin from rice straw using alkali and acid treatments.
- The residue obtained after filtration contained organic matter, including holocellulose, highlighting the presence of biomass constituents. This composition offers potential for further utilization in various applications, such as biofuel production or value-added chemical synthesis.
- The experiment opens up opportunities for future research and exploration. Further investigating the properties of the extracted silica and lignin, and exploring the potential applications of the residue. Additionally, the utilization of the residue for bio-oil production and other bio-based materials could be an interesting avenue to explore.

REFERENCES

- Ayu Haslija Abu Bakar and Chong Jia Ni Carey 2020 *IOP Conf. Ser.: Mater. Sci. Eng.* **778** 012158
- Khaleghian H, Molaverdi M, Karimi K. Silica Removal from Rice Straw To Improve its Hydrolysis and Ethanol Production. *Industrial & Engineering Chemistry Research* 2017;56(35):9793-9798, doi:10.1021/acs.iecr.7b02830