Valorisation of sludge biomass from civil wastewater

Reshma BABU[1,*], **Gustavo CAPANNELLI**[1], **Antonio COMITE**[1]

[1]*University of Genoa, Department of Chemistry and Industrial Chemistry, via Dodecaneso, 31, 16146, GENOA*

**Corresponding author: reshma.babu@edu.unige.it*

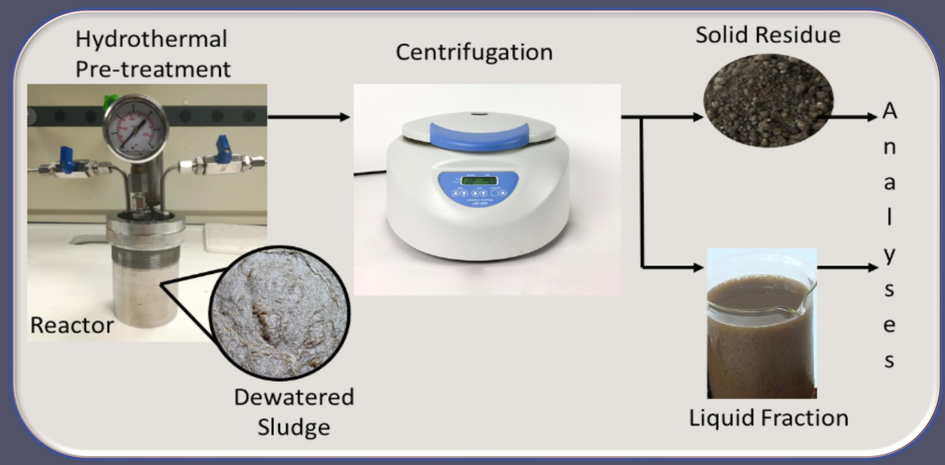
1. Introduction

The growing consumption of energy worldwide, the depletion of fossil fuel resources and global warming have long been encouraging the use of renewable sources such as biomass to meet energy demands. With a circular economy vision, the valorisation of secondary biomass and waste can be a sustainable way to obtain useful products such as fuels and chemicals. Among the most interesting biomasses are those obtained from sludge produced in civil and industrial wastewater treatment plants. With the growing increase in the number of wastewater treatment plants and increasingly stringent rules for the discharge of effluents, the sludge production rate is expected to increase. Traditional technologies are currently focused on the degradation and minimization of the sludge volume. However, the sludge biomass contains a significant concentration of organic carbon which after the pre-treatment could be valorised into bioproducts.

2. Method & Strategy

This work presents an approach to the valorisation of sludge from civil wastewaters and the results of hydrothermal pre-treatment tests on them.

- Used 80 ml dewatered sludge (Total Solids 15 g/L, Volatile Solids 12.2 g/L) in 300 ml batch hydrothermal reactor
- **Tests done at 180°C at 3 different pH conditions for reaction time of 1 hr:**
  - **pH 6- original pH of raw sludge**
  - **pH 12- sodium hydroxide addition**
  - **pH 3- hydrochloric acid addition**
- Solid fraction analyses: total, volatile, mineral solids
- Liquid fraction analyses: total organic carbon, chemical oxygen demand (COD), nitrogen, total phosphorus and carbohydrates

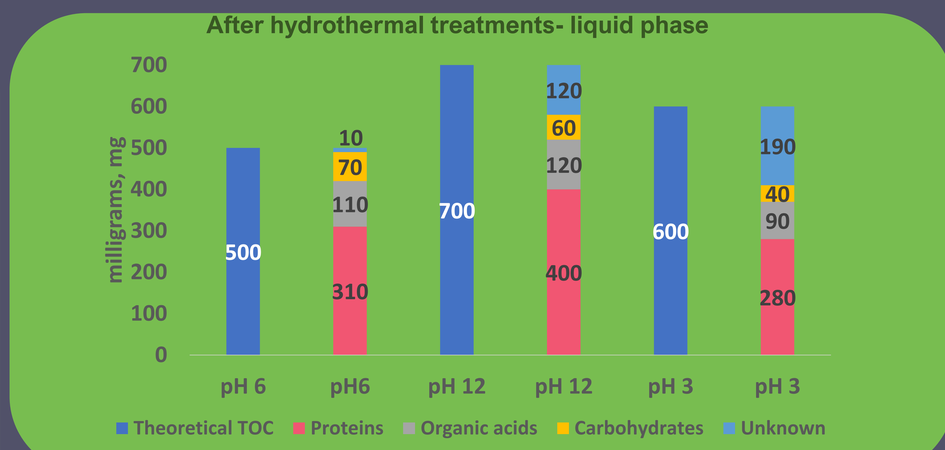


3. Results & Conclusions

Parameters- Liquid Phase	pH 6	pH 12	pH 3
Total Dissolved Solids, g/L	6.7	9.8	7.2
Volatile Dissolved Solids, g/L	5.9	8.1	6.4
Mineral Solids, g/L	0.8	1.7	0.8
Chemical Oxygen Demand, mg/L	14700	17200	15100
Total Organic Carbon, mg/L	6050	9050	7325
Total Carbohydrates, mg/L	905	779	516
Volatile Organic Acids, mg/L	1390	1486	1168
Proteins, mg/L	3858	4805	3515
Total Nitrogen, mg/L	910	1040	950
Total Phosphate, mg/L	80	80	115

Parameters- Solid Phase	pH 6	pH 12	pH 3
Total Suspended Solids, g/L	7.4	6.2	6.5
Volatile Suspended Solids g/L	5.25	3.97	4.56
Mineral Solids, g/L	2.15	2.23	1.94

- 57%, 68% and 63% of organics were solubilised into aqueous phase after pre-treatments for samples at pH 6, 12 and 3 respectively
- highest % of solid solubilisation at pH 12
- some of the organic molecules still need to be quantitatively identified



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