Sustainable exploitation of paper mill wastes: a resource to re-use in the paper factory

R. LORÈ[1], GUIDO PASQUINI[2],MAURIZIO GIORDANO[2], C. ANTONETTI[1], N. Di FIDIO[1], S. FULIGNATI[1], D. LICURSI[1], A.M. RASPOLLI GALLETTI[1]

[1]*Dipartimento di Chimica e Chimica Industriale, Università di Pisa*
[2]*Lucart S.p.A. – Porcari (Lucca)*
rosaria.lore@phd.unipi.it

In the papermaking industry, billions of tonnes of paper mill wastes are globally produced as wastes every year [1]. These include cellulosic and inorganic sludges, which are traditionally landfilled, leading to environmental and economic issues [2]. For these reasons, it is urgent to develop new sustainable strategies to exploit these fractions. Up to now, these sludges have been exploited *i)* for land application (as soil amendment/substrate), *ii)* for energy recovery and *iii)* for the production of bio-composites [3]. However, the above possibilities involve the direct use of the bulk wastes, without fractionating/exploiting each feedstock component.

In the perspective of the valorisation of the different components, the present investigation has considered different strategies: *i)* a thermal treatment, *ii)* an alkaline and *iii)* a mechanical one, aimed at the fractionation and recovery of the two main components of cellulosic and inorganic sludge, cellulose and calcium carbonate, respectively, that could be advantageously reused within the same papermaking process. A preliminary compositional analysis of these wastes has been carried out and a pyrolysis approach has been developed for the fractionation of the calcium carbonate from the bulk inorganic sludge. This is a thermochemical process where the feedstock is converted/fractionated under nitrogen atmosphere to give a liquid bio-oil, a solid biochar and non-condensable gases. A preliminary phisico-chemical characterization of the recovered fractions has been performed in order to propose their exploitation within the context of a more sustainable and integrated process, in agreement with the principles of the circular bio-economy.

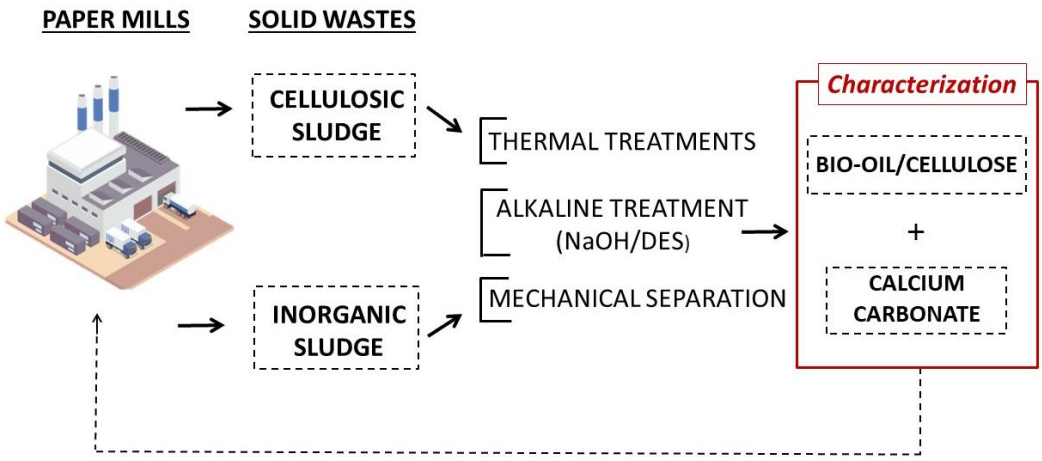

Figure 1. Proposed strategies for the exploitation of industrial paper mill wastes.

References:

[1] G. Jaria, C. P. Silva, *J. Environ. Manage.*, 188, 203-211 (2017).
[2] P. Faubert, S. Barnabé, *Resour. Conserv. Recycl.*, 108, 107-133 (2016).
[3] A. Haile, G.G. Gelebo, *Bioresour. Bioprocess.*, 8, 1-22 (2021).