Characterisation of pulp and paper mill sludge for beneficiation

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ABSTRACT

In this study, three different pulp and paper mill sludge (PPMS) samples collected from different South African mills were chemically and physically characterised to investigate their suitability for various beneficiation pathways. The overall objective was to identify the most suitable beneficiation opportunities for each PPMS sample based on characteristics. The potential beneficiation pathways (identified) were biofuels, building materials (cement and brick), biopolymer/composites, cellulose nanomaterials, composting, land application, and thermal processing (energy). Each of the beneficiation pathways was more suitable for one type of PPMS due to the varying characteristics of the PPMS. The characteristics of PPMS were influenced by the pulping technique employed at each mill, the raw material and the type of effluent treatment employed. Proximate analysis revealed that the calorific values of all PPMS samples studied were too low for energy harvesting (thermal processing). The high ash content of PPMS A and PPMS C was suitable for biocomposites whose strength could be enhanced by fillers present in PPMS. The higher glucose content in PPMS B compared to PPMS A and PPMS C was favourable for bioethanol and bio-oil production. The high cellulose and low ash content of PPMS B were found suitable for the production of nanocellulose.