

MECHANOCHEMISTRY IN THE UTILISATION/MINIMISATION OF WASTES FROM METALLURGICAL AND ALLIED INDUSTRIES

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ABSTRACT

This paper is a critical review on application of mechanochemistry in the Bayer process, blended cements (Portland Slag Cement, Portland Pozzolana cement) and fly ash based geopolymers. The review has three parts:

- Basic findings on mechanical activation of bauxite, granulated blast furnace slag and fly ash - the emphasis is on mineral interaction in the activation of bauxite, surface activation of slag, and activation of glass phase in fly ash;
- Novel processes/products involving mechanical activation with the ultimate objective of waste minimisation (red mud in Bayer process) and utilization (in blended cements and geopolymers);
- Barriers and research needs in implementation of the processes/products (Table 1).

Process/Product	Mill	Barriers/research needs
Bayer process	Attrition mill	Behaviour of impurities such as silica Evaluation of role of mineralogy Settling behaviour of red mud Integration with existing plant Scale up of mill
Portland Slag Cement (PSC)	Attrition mill	Portable mill for on-site usage in ready mix concrete industry Large size mills for cement plants
Portland Pozzolana Cement (PPC)	Attrition mill, Vibratory mill	100-200 fold increase in vibratory mill capacity, Evaluation of the bank of available mills
Geopolymer cement	Attrition mill, Vibratory mill	Large scale evaluation of the process

Table 1. Mechanical activation based processes, mill(s) used, and barriers and research needs