Production of Recycled Products from Coal Ash Using a Plasma Enhanced Melter™

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Integrated Environmental Technologies, LLC, has developed the technology to recycle coal ash into valuable resources using the Plasma Enhanced Melter™ (PEM™) for treating and vitrifying the ash. Coal ash, containing primarily inorganic residues can be converted into glass in the high temperature environment of the PEM™. By suitably modifying the glass matrix, the molten glass can be used for the production of byproduct materials. The PEM™ uses a DC plasma to gasify any residual carbon and melt the ash in combination with an AC powered Joule melter system to maintain the bath temperature. Any carbon or other organic material in the ash will be reacted with steam to form a syngas consisting of primarily CO and H_2. After passing through a gas cleaning system, the syngas is either used to generate electricity via an internal combustion engine/generator set or is flared if the quantity of gas is insufficient to economically justify the investment in a generator set.

The molten glass matrix is tailored to reach a target composition of the silica, alumina, and other constituents. Products produced include high quality grit blasting media, roofing tiles, and brick. The recycle concept uses the coarse fraction of the crushed glass for grit blasting media and the fine fraction for forming the low density, solid products. While the glass density is in the normal range of 2.5 to 2.8 g/cm3, the density of the tiles and brick can be adjusted to between 0.7 to 1.0 g/m^3 depending upon the material strength required. The low density of these roofing tiles provides a unique advantage for building construction since the supporting structure need not be as robust as for clay tiles, for example.

The paper will provide a description of the PEM™ and show examples of the recycle materials developed from coal ash and other waste material inorganic residues.