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Use of industrial wastes to obtain of products with high added value

Recovering of products with high added value from the industrial wastes (i.e. slag, bottom/fly ash, incineration residue of municipal waste) has not only environmentally beneficial but also profitable from an economic point of view. Literature in the field is vast, but most refer to issues related to industrial waste leaching, and less of them relate to waste recycling issues. For example, if we refer to the recycling of iron from industrial waste, this is imposed by three factors: (i) increasing the amount of waste with high iron content; (ii) the need to develop new technologies for recovering metals from waste; (iii) the rising prices of metals obtained from ore. Because the composition of industrial waste is highly variable, it is difficult to derive meaningful conclusions by comparing published results from different sources. For example, waste incineration is expensive, but has distinct environmental advantages over landfilling. Through incineration, the organic content of the waste is converted into thermal energy which can be used for electric or thermal energy generation. The incineration residue consists essentially of inorganic materials and metals. Thus, the complex chemical reactions of organic compounds, e.g. acids and chelating agents, with metals are prevented. In contrast, the inorganic chemistry of mineralized incineration residues is well understood and can be fairly easily controlled. In the wastes the metals are found in elementary form or in the form of chemical compounds (mainly as oxides). In the context of metals recovery from ash, native metals and metal oxides are of commercial interest. This research refers in first part, in general terms, at recovery of non-ferrous metals from waste incinerator bottom ash and in the second part refers at aluminium recovery as alumina (Al_2O_3) from coal fly ash by a novel pre-desilication process. By this process, the consumption of Na_2CO_3 has decreased significantly due to the adjustment of Al/Si molar ratio in the raw materials. The effects of pre-desilication conditions on the dissolution of SiO_2 in coal fly ash, on the consumption of Na_2CO_3 and the phase transformations and the alumina dissolutions at various consumption of Na_2CO_3 were investigated. The mixed coal fly ash with an Al/Si molar ratio of 1 could be obtained by mixing desilicated and the as-received coal fly ash. The dissolution of Al_2O_3 of the mixed coal fly ash reached ~87.5% at the Na/Al molar ratio of 1. The consumption of Na_2CO_3 decreased obviously and the reduction percentage reached 53.4% at Na/Al molar ratio of 1.0 after undergoing the pre-desilication process compared with the Na_2CO_3 direct activation process. This work could provide a novel way for the utilization of coal fly ash with high value and high efficiency. Considering that less than half of the metals out of consumer wastes can be directly recycled (by way of separate collection), it is peculiar that their recovery from the residual industrial waste to receive all the support because represents a viable way to manufacture of products with high added value.

Biography

E David is a graduate of Faculty of Chemistry and Chemical Engineering, MS in Physics-Chemistry of Surface and Analytical Chemistry of Babes-Bolyai University from Cluj-Napoca, Romania. She serves as a Doctor in Chemical Science, Associate Professor, Head of Department of Carbonic Materials, Composites & Analysis Techniques, at National Research Institute of Cryogenics & Isotope Technologies- Rm.Valcea, Romania. She is an author of more than 20 inventions in the field of Environment, Energy, Waste Recycling, and Materials. The World Intellectual Property Organization (WIPO) awarded the WIPO prize, both at the International Exhibition of Inventions in Geneva, Switzerland (April 2012) and Brussels, Belgium (November 2014), for two inventions in the field of Waste Recycling and Clean Energy. In 2017 she was awarded with the Grand Prize of the Second Invention Salon from Barcelona for an invention in same field. She held over 80 lectures at national and international scientific conferences and congresses, has published over 140 scientific papers in prestigious national and international publications. She is a Member of the World Academy of Materials and Manufacturing Engineering (WAMME); Physical European Society; Association of Computational Materials Science and Surface Engineering, Gliwice, Poland. She acts as Reviewer for prestigious international journals too.

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