

# Waste to Wealth in Mineral and Metallurgical Industries



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## Abstract

The present short note deals with the generation of wastes in mineral and metallurgical industries and its effect in environmental pollution. The advances in technology development with particular reference

to research and development on the utilization or recycling of wastes for wealth are also discussed in this paper.

Key words: Mineral, Metallurgical, Wastes. Coal, Complex Sulphides, Iron Ore, Atomic Minerals

## Introduction And Discussion

Presently in India, more than 960 million tons of solid waste is being generated annually as by-products during industrial, mining, municipal, agricultural and other processes. Of this 350 million tons are organic wastes from agricultural sources; 290 million tons are inorganic waste of industrial and mining sectors and 4.5 million tons are hazardous in nature. Indian hematite ores are generally rich in iron content but usually have high alumina. The current mining methods generate a lot of fines, almost to the extent of 60%. Also, the slimes

generated during beneficiation contain an iron value of 40-55%, which are being discarded as tailings. The amount of iron ore being lost in the tailings is of the order of 10 - 15 million tons per year. These slimes are readily available in finer size typically assaying 55-60% Fe and 6 - 8% alumina eliminating the need for grinding to finer sizes. The huge accumulation of slimes poses environmental problems particularly during rainy season when these fines get washed away and affect the agricultural fields and water bodies.

The inventory of coal resources in India, as on 1st April 2017 stands at 308.09 billion tones. Annually 550 to 600 million tons of coal is produced out of which about 131.1 million tons is washed in Private and Public washeries. The rejects generated from these washeries is to the tune of 26.2

million tons annually. Coal India Limited, is proposing to set up about 15 coal washeries in another 5 years' time, to wash about 120 Million tons annually and the rejects to the tune of 24 million tons will be generated annually.

Indian beach sand mineral separation plants are designed to operate feed containing more than 20% heavies and rejecting total heavies contain around 3% THM, whereas in Elsevier some plants are designed to recover Total Heavy Minerals from feed sample containing less than 3% THM. In view of an attempt is to recover THM from Indian beach sand plants tailing which is containing around 3% THM. Nano structured high purity grade lanthanum zirconate could be prepared from these THM containing monazite and zircon in a chemical route. The powder could be successfully sprayed onto gas turbine parts using APS and bi-layer TBC was realized. Sintering method of nano powder was followed to agglomerate to make the powder suitable for air plasma spraying. Recovery of monazite, source of uranium and thorium can also be recovered by which we gain multifold benefits such as very low generation of hazardous monazite fine dust, utilisation of phosphate value and better uranium thorium and rare earth recovery process. This type of work so far no one attempted and hence this attempted is justifiable from the view point to improve National economy and conserves the high grade deposits.

Mill Tailing Dumps all around KGF called "Cyanide Dumps" because of its content of "Cyanide used to extract the gold from the Ore. The continuous mining activity for the last 100 years in this area has resulted in

the accumulation of huge dumps of mining waste (mill-tailings) occupying 10% of the total area in the township of the KGF. Besides occupying about 10% of the total land in the township these tailing dumps rise to a height of about 30m from the ground. Gold ore assays 2-3g/t of Au. Tonnage treated at Hutti mines is 2000 tpd. Tailings generated per day are almost feed rate 2000 tpd. These tailings are having 0.02% WO<sub>3</sub>. Presently only gold recovery is done in Hutti gold mines. A complex process for the recovery of copper and zinc from mining and metallurgical wastes has been investigated and proposed by several investigators. It was concluded that acid leaching of base metals from old pyrite flotation tailings with pregnant leach solution for the ferric leaching of copper converter slag flotation tailings is a prospective and promising technique for the complex treatment of mining and metallurgical wastes.

Odisha has rich mineral reserves constitute 28% Iron ore, 24% coal, 59% Bauxite and 98% Chromite of India's total deposits. In Odisha while mining of one ton of chromite ore around ten tons of chromite over burden is removing as mining waste which contain Up to 1% nickel content. Similarly to recover one ton of alumina about ten tons of waste is being generated. These wastes are at present man made mountains. Major industries in Odisha at the moment include an integrated steel plants at Rourkela, Kalinga Nagar, Jharsuguda and Angul; Ferro alloys plants at Balasore, Dubri, Angul etc., NALCO (National Aluminium

Company Ltd.) with its Alumina Plant at Damanjodi & Aluminium smelting complex at Angul; Thermal power plants Talcher & Ib valley area etc. The importance of tailings can be understood by the proverb "Today's tailing is tomorrow's ore" prevalent in the mineral processing profession. Thus all these mineral and metallurgical plants are producing enormous wastes which are under the scope of utilization for industrial and societal benefit.

### Conclusions

The following conclusions are drawn from the study on Waste to Wealth in Mineral and Metallurgical Industrial Wastes in India.

The present paper discussed on the generation of wastes from mineral and metallurgical industries and some of the problems which are solved by the different investigators are also discussed. It is noted that the importance of tailings can be understood by the proverb "Today's tailing or metallic waste is tomorrow's ore" prevalent in the mineral and metallurgical processing profession. Thus it can be concluded that all these mineral and metallurgical plants are producing enormous wastes which are under the scope of utilization for industrial and societal benefit.