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SINTERING ZINC CONCENTRATES

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This invention relates to the sintering of zinc ores containing cadmium and particularly concerns certain improvements by which a markedly increased elimination of cadmium is readily obtained.

In treating zinc ores, it is common practice to subject the concentrates to a preliminary roast to eliminate a major portion of the sulphur content after which the partially roasted concentrates are mixed with a suitable amount of coke and sintered, the sintered product then being charged to a reduction retort for the production and recovery of zinc metal.

In the case of zinc concentrates containing cadmium, the elimination of the cadmium prior to making up the charge for the reduction retorts is of considerable importance as otherwise the cadmium will appear as a contaminant in the recovered zinc metal. At best the separation of cadmium from zinc metal is an expensive operation and for this reason together with the fact that the cadmium itself is a metal of considerable value, a great many proposals have been made in the past to improve the cadmium elimination during the preroasting and sintering operations for the dual purpose of preventing contamination of the zinc metal and promoting economical recovery of the cadmium itself. Among these proposals may be mentioned the chloridizing roast, the provision of a greater proportion of fuel in the lower portion of the sintering bed and the mechanical separation of the lower portion of the sinter bed in which the cadmium elimination tends to decrease.

The present invention relies on none of these proposals but employs an entirely different concept resulting in a marked increase in elimination of cadmium during the sintering operation at practically no increase of cost. It is based upon the discovery that the character of the carbonaceous fuel which is mixed with the preroasted concentrates to form the sinter charge exerts a most critical influence on the percentage of cadmium elimination during the sintering operation. Thus, while the art has long since employed coke as the carbonaceous constituent of the sinter charge, it has also assumed that other carbonaceous fuels, such as coal, are equivalents. That this assumption was, for the most part, an erroneous one will be readily perceived as the present description proceeds.

What may be termed standard practice in some of the largest zinc sintering plants on this continent may be briefly outlined as follows: the zinc concentrates which may analyze, say, approximately 55% zinc, 0.5% cadmium and 30% sulphur, are treated in a Ropp or Skinner roaster to reduce the sulphur content to between 5% and 7.5%. The preroasted concentrates are then mixed with 4–5.5% coke and 18–25% returned sinter fines and charged to the bed of a sintering machine of the Dwight-Lloyd type. It is not unusual to include in the charge up to 4 or 5% of dust from the roasters which is relatively high in cadmium. The charge, that is the preroasted concentrates, coke and returned fines with or without the dust, is sintered in the usual manner which results in decreasing the sulphur content in the sintered product to well below 1%, say 0.4–0.7%. At the same time only 40–45% of the cadmium is eliminated and appropriately collected, the remainder being retained in the zinc sinter.

It has now been found and actually demonstrated on a commercial scale that cadmium elimination can be increased 50% or more by replacing not less than one-third of the coke normally used in the charge with bituminous coal. While the reason for this phenomenal increase in cadmium elimination through the use of a substantial proportion of bituminous coal is not altogether clear, it is believed that the presence of the volatile hydrocarbons derived therefrom is a factor of major importance in obtaining the marked increase in cadmium elimination.

In comparative tests which were identical except for the replacement of a portion of the coke with bituminous coal, it was found that no appreciable increase in cadmium elimination was obtained until approximately 30%–35% of the coke was so replaced. For example, using a fuel mixture of only 25% coal and the balance coke, cadmium elimination was only 43.6% as against 42.9% using all coke. Varied and repeated commercial runs in which from 50–90% of the coke was replaced by bituminous coal gave cadmium eliminations ranging between 55% and 88%.

Obviously, variations in the type of bituminous coal used will, of course, influence the amount used. Present indications are that 50–75% bituminous coal of average or intermediate volatile content is to be preferred in sintering most zinc ores. However, these figures are not to be regarded in a limiting sense as many other factors are to be considered in the operation. For example, the fineness of the bituminous coal (ten mesh has given excellent results), the increased temperature of the gases not only as same affects cadmium elimination but filtration of same for cadmium recovery as well, the percentage of returned sinter fines in the charge, and other fac-

tors all influence the operation and the amount of coke replaced by bituminous coal.

The marked increase in cadmium elimination which characterizes the present invention is appropriately exemplified by the following results secured in commercial runs. In the first, 1000 tons of preroasted concentrates containing 0.46% cadmium were sintered as hereinbefore described with 50% of the coke being replaced with bituminous coal which resulted in a cadmium elimination of 65%. In another run using a fuel mixture of 60% bituminous coal and 40% coke, the cadmium elimination was 71.5%.

While certain novel features of the invention have been disclosed and are pointed out in the annexed claims, it will be understood that various omissions, substitutions and changes may be made by those skilled in the art without departing from the spirit of the invention.

What is claimed is:

1. In treating preroasted zinc concentrates containing cadmium by sintering the same with coke, the improvement which comprises replacing not less than one-third of the coke content of the charge with bituminous coal and sintering said charge on a machine of the Dwight-Lloyd type thereby materially increasing the percentage of cadmium elimination.

2. The process for treating zinc concentrates containing cadmium which comprises roasting said concentrates to reduce the sulphur content to approximately 5–7.5%, forming same into a sinter charge with approximately 18–25% returned fines and approximately 4–5.5% carbonaceous fuel of which not less than one-third thereof consists of bituminous coal with the balance coke and sintering said charge on a machine of the Dwight-Lloyd type.

3. The method of increasing cadmium elimination in the sintering of preroasted zinc concentrates which consists in replacing a part and not less than one-third of the coke used in the charge with bituminous coal and sintering said charge.

4. In sintering preroasted zinc concentrates containing cadmium employing coke as a carbonaceous fuel constituent, the improvement which comprises incorporating bituminous coal as the major portion of the carbonaceous fuel in said charge thereby markedly increasing cadmium elimination during the sintering operation.

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