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TREATMENT OF HEAT TRANSFER SALTS

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2 Claims. (Cl. 252—71)

This invention relates to methods of maintaining the desirable properties of heat transfer salts, with special reference to alkali metal salts of the oxyacids of nitrogen.

Heat transfer salts with as low a melting point as possible are desirable for controlling temperatures in chemical and other equipment. Thus, where the temperature is maintained between say 700° F. and 900° F. in the zone controlled by the salt, it is desirable for the salt to have a substantially lower melting point, whereby it may be melted by the steam available, which ordinarily runs 400° F. or lower. Thus when a plant is shut down and cooled it is desirable to be able to melt the salt in the lines with such steam in tracers. We have found that in use the properties of the salts change, resulting in an increased melting point, in the formation of deposits which in some instances partially plug some of the lines and in all cases effect a reduction of the heat efficiency of the systems and in the deposition of solid phase from the salt compositions. Accordingly, it is an object of this invention to provide processes for the treatment of such heat transfer salts to maintain a desired melting point thereof and to prevent the deposition of scale or other solid phase from the molten salt.

It has now been found that in the maintenance of heat transfer salts of the type described it is desirable to maintain the concentration of alkali in the salt low, in general below about 5%, and preferably between about 0.2% and about 2%. This has been found to be of substantial importance in maintaining a low melting point and in preventing scale and other depositions, despite the fact that it has been found that limited amounts of alkali reduce the melting point of the compositions.

In accordance with this invention, a molten salt composition comprising principally alkali metal nitrate and nitrite is withdrawn from a zone in which it is employed in molten state and is treated with nitric acid to effect a reduction or lowering of the alkali content of the salt, and the salt so treated is returned to the zone.

The salt composition is employed in the molten state in a zone which may be a cyclic circulating system including in the circuit apparatus such as a catalyst case, the temperature of which it is desired to control, a heat exchanger for adjusting the temperature of the composition, a pump for circulating the salt in the system and a surge tank for allowing some change in the total volume of salt in the system. Suitable piping is provided for conveying the salt from each unit to the next

in the system. It should be understood that this system is merely representative of one form of system in which the molten salt may be employed, and that the present invention, which relates to treatment of such salts, is not limited to any particular type of system in which the molten salt is employed.

Salt is withdrawn from the zone of use and is treated in a reducing zone in which the alkali content of the salt is reduced or lowered and the salt so treated is returned to the zone of use. The salt is withdrawn from the zone of use, treated and returned at such a rate that the alkali in the zone is maintained below 5% and preferably between about 0.2% and about 2%. In some instances the reduction may be carried to the complete elimination of the alkali in the reducer. By the term "alkali" throughout this description and in the subjoined claims it is intended to include both "free" alkali (alkali metal oxide or hydroxides) and alkali metal carbonates.

About 1,000,000 pounds of a molten salt containing 40% NaNO_2 , 7% NaNO_3 and 53% KNO_3 was charged to a heat transfer system involving a plurality of catalytic converter cases, a heat exchanger and suitable pumps and surge tanks. After several months of use the alkali content built up to 1.43% (calculated as NaOH). Salt was withdrawn from the system and dissolved in water at a rate of 10 gallons of water per 100 pounds of salt. Normal nitric acid was added at a rate of 4 gallons per 100 pounds of salt. The treated salt was then dried and melted. The salt so treated while having a melting point slightly higher than prior to treating does not tend to form scale and may be employed by addition to the system to control scaling therein.

While within the broad scope of this invention the salt may be treated in any state with nitric acid, in accord with a preferred form hereof the salt is dissolved in water and the solution is treated with the nitric acid. This procedure is especially desirable due to the conservation of fixed nitrogen and to the completeness of the removal of alkali which may hereby be effected.

We claim as our invention:

1. The process of treating an alkali metal nitrate and nitrite salt composition which in use is maintained in circulation in a heat transfer system in molten state, comprising withdrawing salt from said heat transfer system after it has been used therein with resulting formation of free alkali, treating the withdrawn salt with nitric acid to effect a lowering of the free alkali content of the salt by neutralization, returning salt

so treated to said heat transfer system, and effecting the withdrawing, treating and returning at a rate to maintain the alkali content in said heat transfer system while circulating between 0.2% and 2%.

2. In a process of treating a salt mixture consisting principally of alkali metal nitrate and nitrite which has been maintained in circulation in a molten state in an indirect heat transfer sys-

tem and in which alkalinity and melting point have increased as a result of such use, the steps comprising contacting said molten mixture with nitric acid until the alkalinity and melting point have been decreased, and returning the molten mixture for indirect heat transfer.

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