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INVESTIGATION OF OXYGEN SUPPLY

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Calorimetric measurements of the heat of reaction for Salcomine and for the 3-methoxy, 3-ethoxy, and 3-nitro derivatives were carried out in an improved apparatus. With satisfactory check determinations obtained, the values in calories per gram mol of oxygen absorbed, are 19,600 for salcomine, 20,400 for 3-methoxy, 18,900 for 3-ethoxy, and 17,300 for 3-nitro.

Measurements of thermal conductivity were carried out in a steady-state heat transfer arrangement on solid cakes of salcomine and salcomine mixed with various proportions of aluminum flakes, bronze flakes, and copper powder. Cakes of pure salcomine showed thermal conductivities which increased with increased cake density, and a cake with a specific gravity of 1.10, approximately that of the Rumford "High-High" salcomine, had a conductivity of 0.109 B.t.u./hr./°F./sq.ft. Cakes with up to 10 per cent of either of the three metals showed practically no higher thermal conductivities, indicating that so far as cakes are concerned there is no great advantage in the inclusion of a moderate amount of metals. No extensive measurements of the thermal conductivity of a bed of granules of absorbent with metal included were made, but absorption and desorption runs with such granules showed in comparison with runs on the ordinary absorbent that the desorption was slightly better and the absorption was practically unaffected, except when a very large amount of metal was incorporated in the granules.

Further work on the deterioration of salcomine, although not sufficiently complete to draw a final conclusion, is indicating that when dry air is used the deterioration is a function only of the absolute quantity of oxygen produced per unit of absorbent and is independent of the cycle conditions. Life tests at absorption pressures of 40, 80, and 250 lb. per sq. in. and with long and short cooling periods are giving this indication, and reasonable extrapolation of the data shows that one pound of absorbent during its complete life will produce about 20 pounds of oxygen. If such a conclusion is finally substantiated, the implications will be very important, for adiabatic operation would again appear promising and in the ordinary operation the use of absorption pressures higher than the 80 or 90 pounds for which recent units have been designed would not be unjustified from the standpoint of deterioration.

The effect of moisture in the air, desorption pressure,

and desorption temperature will be studied again, and by analyzing the data on the basis of the more satisfactory picture of deterioration that is now appearing, it is expected that the effect of these variables will be clarified.

Experimental runs using "fluidized" operations on the methoxy compounds are progressing satisfactorily. In these batch operations the 35-80 mesh absorbent powder is suspended in an air stream during absorption and in an oxygen stream during desorption. Little difficulty with carryover of fine dust has been observed. The data of a very few runs show absorption rates which are probably about the same as obtained under comparable conditions with granules packed in a tube and desorption rates which are very rapid. These operations appear promising and the experimental work is continuing in order to obtain complete engineering data on both absorption and desorption.