At the total concentration of 0.05 *M* the size of the particles precipitated from aqueous and three alcoholic solutions, *i.e.* 2.5, 10 and 50%, were 400, 90, 70, and 10 mμ respectively.

At the total concentration of 0.005 *M* the precipitated particles became smaller with increasing of the concentration of alcohol.

At the total concentration of 0.0005 *M* the precipitate in water began to deposit after 30 seconds from the time of mixing reagents and after about 2.5 minutes the precipitation was completed and the particle was ellipse and the size of it was 3.5μ. In 2.5% alcohol the precipitate was formed after a few seconds and the shape was diamond with rugged edges. In 35% alcohol the precipitate was formed as soon as the reagents were mixed and the shape of it was spindle. In 50% alcohol the particle was sphere and the size of it was 10 mμ. These changes in shapes of particles owing to those in the solubilities of $BaSO_4$ are in agreement with changes in shapes by changing the total concentration of $BaSO_4$ in water. That is, the precipitates of the same shape were deposited after the same time from mixing the reagents.

The size of precipitated particles formed in the alcohol solution of the same concentration became larger with decreasing of the total concentration as shown in Table 1. But it seemed there was no simple law in these relations.

(*See, This Bulletin*, **31**, 48 (1953), and *Proc. Japan Acad.* 28, 133 (1951).

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10. Studies on the Zinc-ferrite

On the Relation between the Temperature of Preparation of the Fe_2O_3 and its Activity of Zinc-ferrite Formation

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Zinc-ferrite is known as the compound of spinel type $ZnFe_2O_4$, and its structure, formation temperature and magnetism *etc.* are affected by the property of Fe_2O_3. But on these points it has not been precisely determined up to present, so that we have intended to study on the relation between the preparation temperature of the Fe_2O_3 and its activity of zinc-ferrite formation.

As the sample, the pure Fe_2O_3 was prepared by means of decomposition i), $Fe(OH)_3$ by heating it at 300°, 500° and 800°C respectively, ii) $Fe(NO_3)_3$ by heating it at 900°C. and iii) ferrous oxalate by heating at 500°C in the air. The pure ZnO was prepared from pure $ZnSO_4$.

The Fe_2O_3 and the ZnO are mixed in the exact proportion so as to furnish ZnO. Fe_2O_3, and the mixture is heated at 500°, 600°, 700°, 800°, 900°, and 1300°C each for 15, 30, 60, and 120 min. Then the free ZnO in the roasted sample is leached in Maspratt's solution.

The results were as follows :

A. The rate of formation of zinc-ferrite was sensible to the heating temperature, and greatly affected by the origin and the preparation temperature of the Fe_2O_3 used.

i. The Fe_2O_3 obtained from ferrous oxalate was most active for the formation of zinc-ferrite. In this case, the reaction velocity was fast, and it required 30 mins. at 800°C. for its completion.

ii. The Fe_2O_3 obtained from $Fe(NO_3)_3$ was more active for the formation of zinc-ferrite than the Fe_2O_3 obtained from $Fe(OH)_3$, but less than the Fe_2O_3 obtained from ferrous oxalate. In this case, reaction velocity was considerably fast, but the yield was limited to about 80 % for the heating temperature at 800° and 900°C.

iii. The Fe_2O_3 obtained from $Fe(OH)_3$ was least active, and it required 30 mins. at 1300°C for its completion. Under the same condition, the higher the decomposition temperature of $Fe(OH)_3$, less the yield of zinc-ferrite.

B. As to the composition of zinc-ferrite, it could not be confirmed accurately. It seems necessary to consider that the zinc-ferrite is probably capable of making solid solution with the Fe_2O_3 and the ZnO. On this point we are now on the research.

C. Zinc-ferrite had not ferromagnetism unless the used Fe_2O_3, as the raw material, had not ferromagnetism.

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11. On the Density Distribution of Fluidized Bed and the Miscibility of Different Fluidized Particles

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The density distribution of fluidized bed along different heights was measured by taking out the particles through the branched tubes equipped to the fluidizing-glass-tube.

The density is given as the value dividing the weight of particles taken out by its volume in fluidizing bed (state).

The density distribution varied with the linear velocity of fluidizing fluid (gas or liquid) U, the range of particles size distribution and the total mass of particles W_s.

This result of experiments is given by the following equation

$$\rho = \rho_b - \frac{A}{W_s} \frac{\rho_b - \rho_t}{aU+1} h$$