

SOLUBILITY OF CORUNDUM IN AQUEOUS ALKALINE
SOLUTIONS AT ELEVATED TEMPERATURES AND PRESSURES

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Dependence of the Solubility of Corundum on Pressure. Barns, Laudise, and Shields [1] have shown that the pressure dependence of the solubility of corundum ($\alpha\text{-Al}_2\text{O}_3$) in aqueous solutions of sodium carbonate is complex. For example, at 430°C , the solubility of corundum in 3.4 m Na_2CO_3 increases with an increase in pressure up to 1380 bars, but a further increase in pressure has no effect on the solubility, and even possibly decreases it somewhat. It is also known that the solubility of sodium carbonate in water at elevated temperatures depends greatly on pressure [2]. It might well be assumed that the solubility of corundum in aqueous solutions of sodium carbonate depends directly on the state of the Na_2CO_3 in the system.

The results of an experimental confirmation* of this assumption are shown in Fig. 1.

A comparison of the experimentally determined pressure dependence of the solubility of corundum in aqueous Na_2CO_3 at 460° with the pressure dependence of the solubility of Na_2CO_3 in water at this same temperature [2] indicates that the increase in corundum solubility with increasing pressure (at constant solution concentration) continues until all of the Na_2CO_3 introduced into the system has gone into solution. A further increase in pressure has a very slight effect on the solubility of corundum.

*The solubility of corundum was studied in 50-ml autoclaves equipped with tightly fitting protective silver inserts by determining the loss in weight following quenching [1, 3]. Synthetic corundum leaves and cp reagents were used in the experiments. According to Kuznetsov [3], solution of corundum under hydrothermal conditions requires 1.5 days for establishment of equilibrium. On this basis, we elected to hold our solutions at the given temperature and pressure for from 2 to 5 days, since this ensured that equilibrium was reached in the system. The pressure under any set of experimental conditions was determined from the P-F-T diagrams published by Samoilovich for aqueous solutions of sodium carbonate and sodium hydroxide [4]. The temperature was held at the desired value within $\pm 3^\circ$.

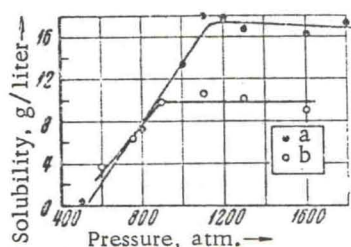


Fig. 1

Fig. 1. Dependence of the solubility of corundum in aqueous sodium carbonate solutions on pressure at 460° . Na_2CO_3 concentration: a) 50 g/liter; b) 25 g/liter.

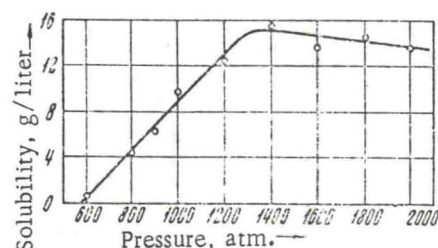


Fig. 2

Fig. 2. Pressure dependence of the solubility of corundum in aqueous NaHCO_3 with a concentration of 100 g/liter at 500° .

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