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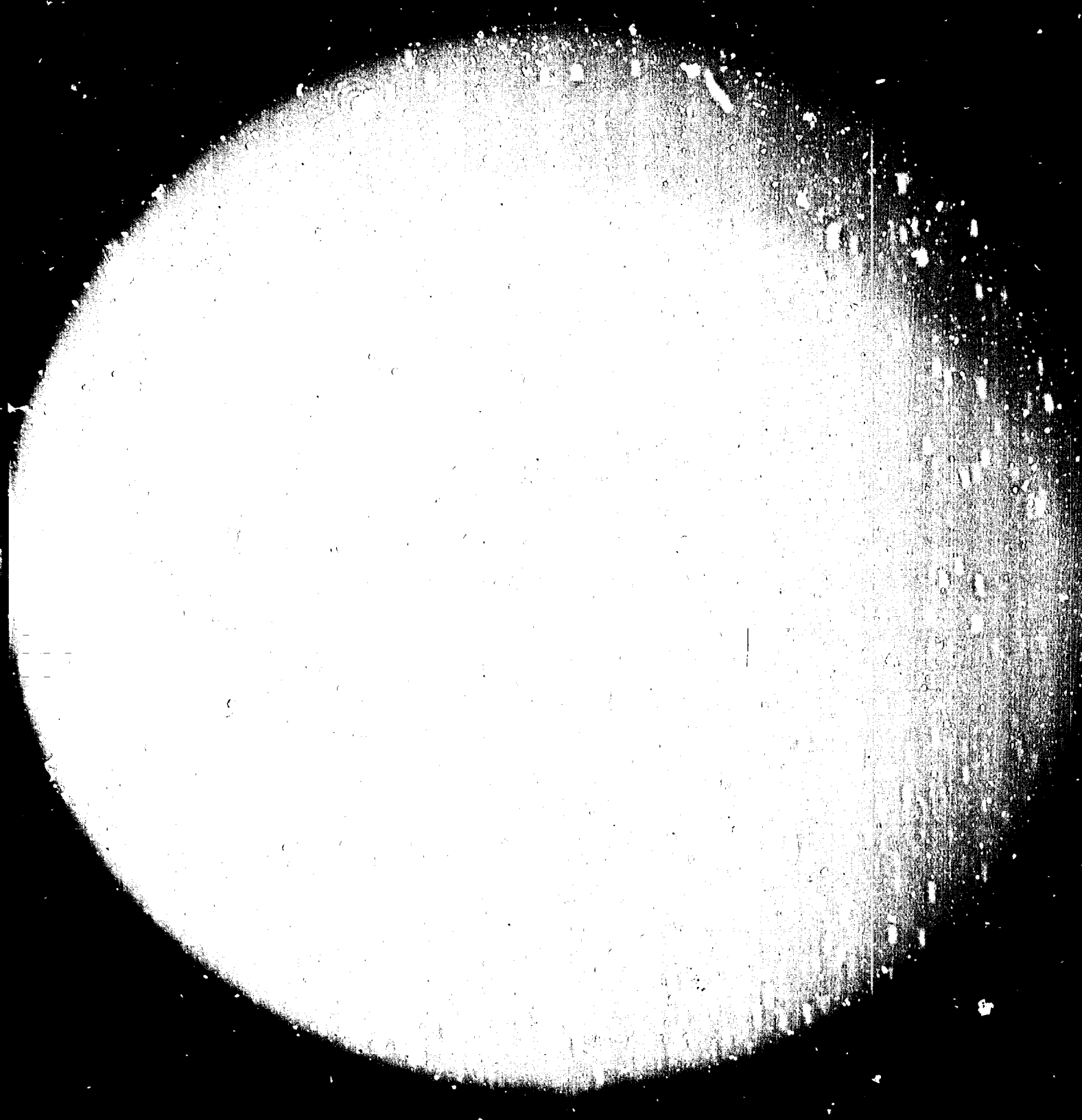
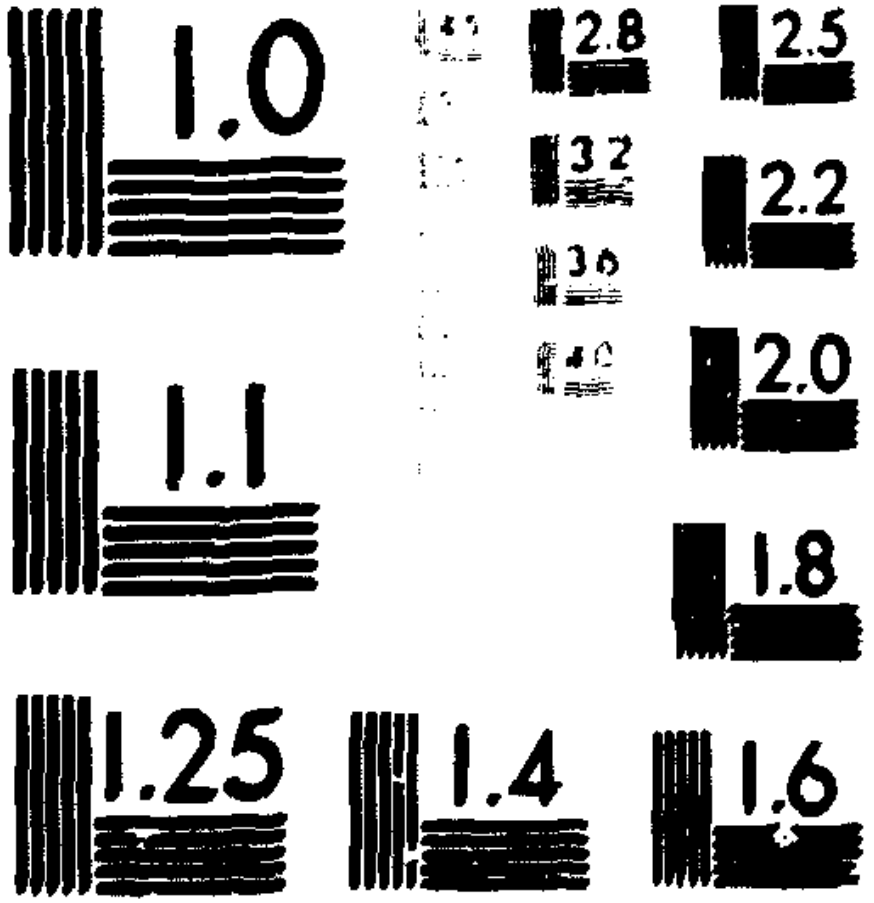
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org





→ Maria Diedrich

UNIDO-Czechoslovakia Joint Programme for International Co-operation in the Field of Ceramics, Building Materials and Non-metallic Minerals Based Industries

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ANHYDROUS SODIUM SULPHATE MANUFACTURE

(Brief Information)

By: Jan Krejsa

Special consultant: Z. Engelthaler

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Sodium sulphate decahydrate as a natural mineral is known as mirabilite or Glauber salt. The richest natural deposits of natural sodium sulphate have been found in the U.S.A. (Arizona), Canada (Sascatchewan), Chile and Central Asia. Some of these large deposits are being exploited while the crude sodium sulphate has to be beneficiated before further industrial processing takes place. Relatively pure sodium sulphate decahydrate originates from some types of mineral water sediments or it is artificially gained from mineral waters. Such a form of natural sodium sulphate decahydrate is applied without any other beneficiation.

The manufacture of the anhydrous form of the sodium sulphate runs usually through two steps:

- beneficiation of the crude mineral
- dehydration process

I. Beneficiation of the crude mineral

Mirabilite is usually obtained by open-cast mining. The crude mineral is crushed in a jaw breaker or roll crusher. The crushing equipment does not necessitate any special requirements because the crude raw material is well workable (mineralogical hardness 2 - 3). The ground material is washed in a drum washer then in order to remove all the insoluble impurities. The washing process operates usually with the recirculating washing water, the last being filtered only. The drying is usually carried out in a rotary drier at temperatures up to 80°C the heating period being as short as sufficient to remove the excess surface water

The drying of the ground washed mirabilite must also be carried out by the action of hot air rather than by the action of the temperature.

III. Dehydration process

The anhydrous sodium sulphate is produced by the dehydration of the purified and beneficiated natural decahydrate. Sodium sulphate occurs in three crystal modifications:

$Na_2SO_4 \cdot H_2O$ ..... monohydrate

$Na_2SO_4 \cdot 7\ H_2O$ ... heptahydrate

$Na_2SO_4 \cdot 10\ H_2O$ ... decahydrate (mirabilite)

Sodium sulphate decahydrate contains 56% of bonded crystallization water. At the temperature of 32 - 33°C this water of crystallization is given off completely and the melting of crystals occurs. The industrial dehydration process is just based upon this behaviour: The sodium sulphate decahydrate is heated in a rotary kiln up to 120°C while the crystals are melted in their water of crystallization and at such elevated temperature the excess water is evaporated, the original water content being reduced from 56% to 25 - 27%. This intermediate product with water content of about 25 - 27% does not tend to form any crystal modification above mentioned even at lower temperatures. It can be completely dried at the temperatures above 200°C. The final product contains usually up to 1,5% residual water depending on the efficiency of the applied drying equipment (rotary kiln, drum drier, etc.) Anhydrous sodium sulphate is

cooled and packed immediately to be protected from the moisture.

Anhydrous sodium sulphate manufactured from natural decahydrate usually contains 95 - 98% of sodium sulphate and from this point of view its commercial quality corresponds to the technical grade only. Impurities such as salts of iron, calcium, aluminum and free acids and insoluble matter residuals as well should not exceed 1,5% from total.