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AN EARLY SWISS COMMERCIAL DTA INSTRUMENT

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ABSTRACT

An apparatus "für thermische Differentialanalysen an Mineralien (keramischen Massen)", produced commercially in Switzerland in 1960-66 but not, apparently, referred to in the literature at the time, is described for the historical record.

INTRODUCTION

Most, if not all, commercially produced thermoanalytical instruments are referred to somewhere in the literature, so that scientists and scientific historians are aware of their existence and characteristics. However, the present instrument does not seem to have been so treated and only a passing reference to it is known. (ref. 1). It seems desirable, therefore, to describe its nature and characteristics before all evidence is lost.

The author encountered two of these instruments at the National Research Centre, Dokki, Cairo, Egypt, in 1967 and had the opportunity of using one of them, the other being out of action through shortage of photographic recording paper. At the time, he was much impressed by the instrument, which was satisfactory for most clay studies, and made a note of the manufacturer's name. This was, unfortunately, mislaid but came to light again recently, when enquiries showed that the firm - E. Schiltknecht Ing. SIA of Zürich (now of Gossau) - was still in existence. Through Prof. H.R. Oswald, the author was put in touch with Mr Armin Berger of this firm, who had been in charge of production of the instrument, who has provided most of the information given below, and who has most kindly given permission for publication.

DESCRIPTION

The specimen holder (H, Fig. 1; Fig. 3) consisted of three nickel sleeves fitting tightly on top of the ceramic thermocouple-entry tubes set in the block symmetrically with respect to the axis of

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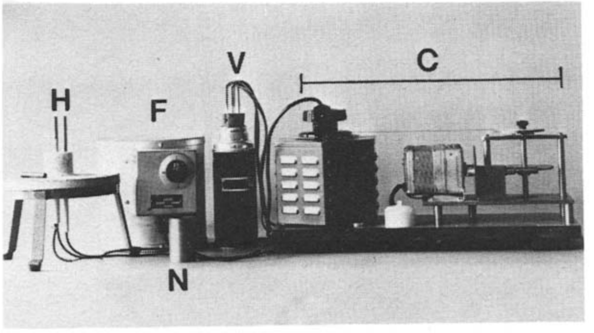

Fig. 1. Photograph showing specimen holder (H), nickel shield (N), furnace (F), vacuum flask for cold junctions (V) and temperature-control arrangement (C).

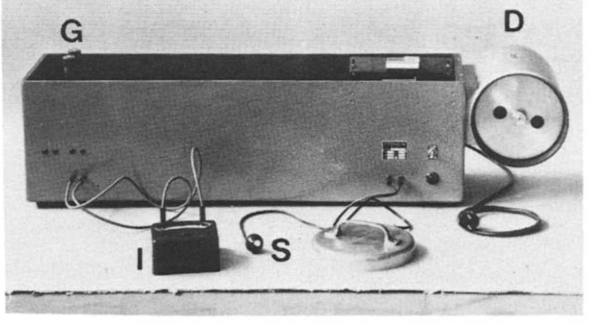

Fig. 2. Photograph showing recording system (covers removed) with the two galvanometers (G), the temperature indicator (I), the recording drum (D) and the press-switch (S) for flashing light on drum.

the furnace. This system was covered with a nickel shield (N, Fig. 1) to ensure a good thermal environment. When the furnace (F, Fig. 1) was in position, the thermocouple junctions were central vertically in the furnace. One of the holders filled with reference material

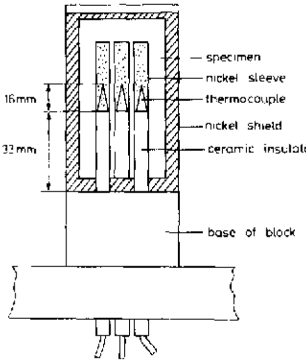

Fig. 3. Specimen holder.

was used for the temperature record, while the other two gave the ΔT trace. An additional entry tube was provided for atmosphere control and the furnace itself incorporated a fine gold wire, acting as a fuse to prevent overheating. The heating rate, nominally 12 K/min from 200 to 1000°C, was controlled by an electric motor-cam-autotransformer system (C, Fig. 1; Fig. 4).

The temperature and temperature-difference thermocouples were connected, through cold junctions in a vacuum flask (V, Fig. 1), to two galvanometers (G, Fig. 2) of sensitivity 0.15 mm/K and 2 mm/K, respectively. The actual sensitivity of the ΔT system could be adjusted by a rheostat. In addition to being connected to a galvanometer, the temperature thermocouple was also connected to a visual temperature indicator (I, Fig. 2) and a press-switch (S, Fig. 2) was provided for flashing a line on to

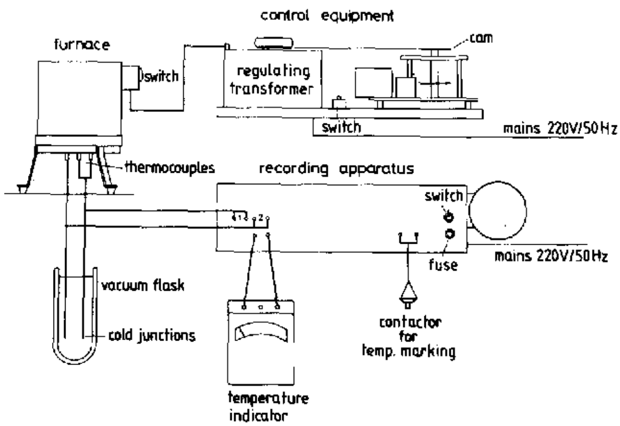

Fig. 4. Diagram showing general construction.

the photographic record at selected temperatures. The recording drum (D, Fig. 2), driven by a synchronous motor at 5.4 mm/min (90 min per revolution), could be withdrawn in its light-tight container from the galvanometer box and taken to the darkroom for charging and development. The general lay-out is summarized in Fig. 4.

OPERATION

Detailed instructions were provided. Briefly, after the specimen holders were filled and the nickel shield and furnace located, the autotransformer was set to a marked point and the drum, in its container and charged with photographic paper, slid into place. The galvanometer null points and the sensitivity of the ΔT galvanometer were then adjusted and the instrument switched on. A line was flashed on the drum each time a reading was taken on the indicator. At 1000°C, the instrument was switched off, the drum in its case taken to the darkroom and the record developed.

DISCUSSION

For its time, this instrument was well designed, easy to operate, sturdy enough to stand up to usage by unskilled staff and of adequate sensitivity for most clay studies. The sample, however, could not be weighed after loading in the sample holder and any weighings had to be by difference.

Designed in 1959, the first models were sold in 1960. According to the firm's records, during the period 1960-66, 12 instruments went to China, 2 to the National Research Centre, Cairo, 1 to the National Institute, Buenos Ayres, and 1 to Varimex, Warsaw. Mr Berger comments: "There may have been a few more sold, but I cannot find any record". Total sales would thus appear to have been some 16-20 instruments. The price in 1960-63 was sFr. 6545.- and after 1963 sFr. 7200.-.

Schiltknecht, at that time, also produced other thermoanalytical instruments, including a thermobalance, a differential thermobalance and a thermodilatometer: its main output now is in meteorological equipment.

REFERENCE

1 R.C. Mackenzie, Thermochim. Acta, 73 (1984) 307-367.