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COMPUTERIZED SEDEX (SENSITIVE DETECTOR OF EXOTHERMIC PROCESSES)

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ABSTRACT

An instrument suitable to carry out a wide scale of industrial basic and advanced thermoanalytical and calorimetric methods is described. Examples of its application are submitted.

INTRODUCTION

The instrument formerly developed for sensitive detection of the initial temperature of exothermic processes, has become an unusually flexible system for the investigation of the thermal behaviour of substances and reaction mixtures under production plant conformable conditions. This is possible thanks to the sophisticated design of the sample chamber (oven) and the computerized control and data acquisition device.

OVEN DESIGN

The oven design make possible:

- easy stirring of the samples during the measurements, which is especially important for suspensions and emulsions
- measuring under any (inert) gas atmosphere and while bubbling gas through the sample
- sample containers of various shapes and volumes can be used, also a stirrable autoclave with or without glas lining
- visual observation of the samples during the measurement via a bullet-proof window in the front panel; observation of phenomena like gas and fume evolution, melting, colour changes, glowing, burning, etc. facilitates the interpretation of the results.

CONTROLLING DEVICE

The computerized controlling device allows the choice of one of three operational modes:

- constant temperature
- linear increase of the temperature from 1 up to 600 C/h

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- adiabatic control.

This permits the application of the SEDEX apparatus for a variety of methods, including:

- temperature scanning
- isoperibolic measurements including the tempering method (1) and heat cumulation storage tests (2)
- adiabatic and quasiadiabatic studies (3)
- advanced industrial calorimetric methods including the Over-Adiabatic Calorimetry (4) and Power Scanning Calorimetry (5).

DATA ACQUISITION SYSTEM

The computerized data acquisition system allows the recording of the measured quantities (temperature, heat production and pressure in the intervals as short as 10 seconds. The data are stored on a floppy disk and are displayed during the measurement on the screen. A high-speed matrix printer is used to print the data and a 6-colour plotter is used to visualize the results in a graphical form.

CONCLUSIONS

Thus the SEDEX makes possible the safety investigations of subsatnces and reaction mixtures under any (plant conformable) conditions. Features and advantages of this instrument:

- high sensitivity: better than 1 W/kg sample
- low price
- prompt and accurate results, high reproducibility
- easy operation, no need of attendance during the measurements
- simple evaluation and interpretation of the experimental data
- clear and thorough presentation of the results.

These properties, performances and its remarkable degree of flexibility predestine the SEDEX for safety investigations in the chemical industry or anywhere where a large number of samples must be checked for exothermic processes.

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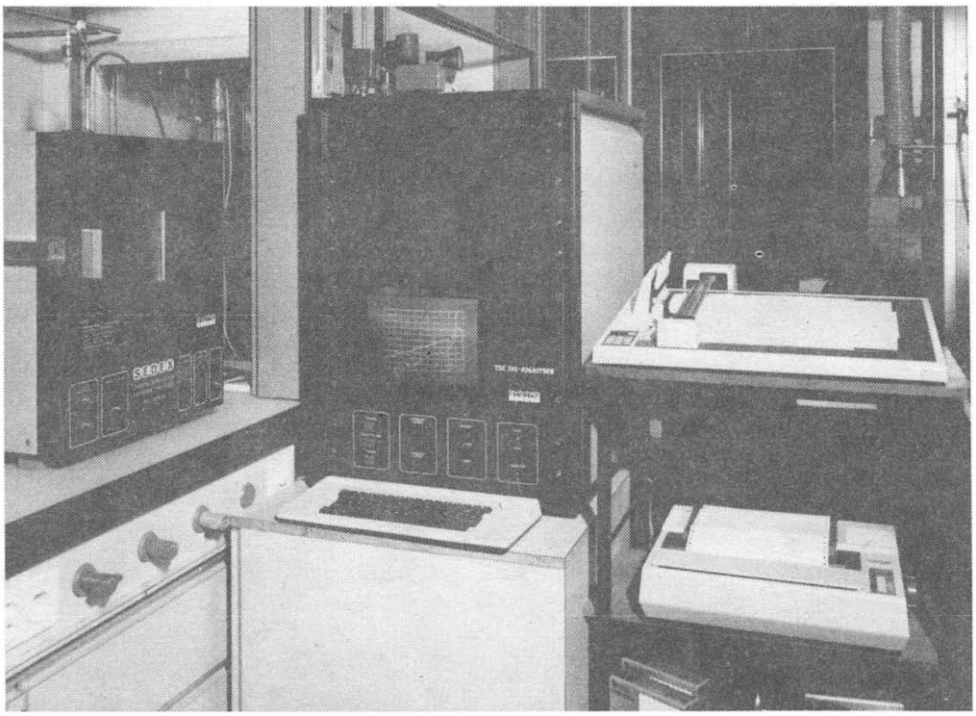

Fig. 1. The overall view of the SEDEX apparatus including the computerized control/data acquisition unit, matrix printer and 6-colour plotter