

# engineering sciences

## MINING

### Portable X-ray mineral analyzer

A hand portable X-ray spectrometer which uses radioisotopes to detect gold, silver or other elements in minerals has been developed by the U.S. Atomic Energy Commission.

Applications include determination of sulfur and ash content of coal, copper and iron content of copper ores, gold and silver in ore concentrates, and calcium and iron content in raw cement mix. The analyzer can also be used to measure the thickness of thin-plated surfaces or to determine the surface composition of alloys of other materials.

The basic instrument, transistorized and battery-powered, consists of an electronic unit containing a single channel pulse height analyzer, scaler, batteries and controls, and a scintillation counter probe containing the source, filters and detector.

The radioisotope emits low-energy gamma or X-radiation which causes the material under analysis to give off X-rays characteristic to the elements in the material. Filters permit only the X-ray peculiar to elements being analyzed to reach the radiation detector. A tungsten alloy shutter closes automatically when the measurement is completed. A typical measurement can be made in one minute or less.

## POLLUTION

### Device measures air pollutants over city

A remote sensing instrument for chemical analysis of pollutants over cities has been developed by Barringer Research, Inc., of Toronto, Canada.

As the instrument is flown over a city, it measures with an accuracy of a few parts per billion the pollutants below it over a 20-mile wide strip. Three-dimensional maps prepared from the data accumulated during the flight show the concentration of air pollution building up, for example over major traffic masses.

Called a correlation spectrometer, the instrument operates on the principle that every object on earth absorbs, emits, or reflects photons (basic electromagnetic units) in patterns with distinctive spectral characteristics. Nitrogen dioxide and sulfur dioxide, for example, have different spectral fingerprints.

In the correlation spectrometer an optical sensor picks up reflected sunlight through the air cover. This sunlight is dispersed by a grating against a mask which has engraved upon it the characteristic spectrum or signature of the gaseous molecules under investigation. Only light which is identical to that imprinted in the mask is registered. By changing the mask, various pollution compounds such as nitrogen dioxide, and sulfur dioxide can be measured.

## ELECTRONICS

### Paper transistors

Transistors, like paper matches, may someday be torn out, used and then thrown away, according to the Westinghouse Electric Corp. in Pittsburgh, Pa.

The Westinghouse process for making this kind of

transistor involves printing thin-film transistors on such common toss-away materials as paper, plastic kitchen wrap and aluminum foil. The process stencils the transistors on these bases, or substrates, with vapors of metal and glass, not ink. The transistors, about an eighth of an inch long, can be bent, twisted and coiled. This flexibility offers the possibility of printing them on data cards, in books, or elsewhere, and suggests their mass production in the form of continuous rolls or strips.

Dr. T. P. Brody, head of the Westinghouse team that developed the transistor says, "We wind a roll of paper or foil through a printer one full frame at a time, just about the way a roll of 35-millimeter film is exposed in a camera, in a single pump-down of the vacuum, instead of one layer at a time with the vacuum recreated each time, as is ordinarily the case with rigid substrates.

Each Westinghouse frame is about the size of a postage stamp and has more than 600 transistors on it; rolls of more than 13,000 transistors have been fabricated, and Brody sees no inherent limit to the roll length.

## COMPUTERS

### Judicial information system

Lockheed Missiles & Space Company, Sunnyvale, Calif., is helping the state of Minnesota design an information system to aid in planning the administration of criminal justice.

General concepts of the projected system call for the collection of information about Minnesota's criminal justice agencies and their programs as well as the crimes and criminals they process—and storage of the information in a computer system. This information can then be used to determine the effectiveness of present programs and pinpoint the need for improved ones.

## AUTOMOTIVE

### System warns motorist against skid

An electronic warning system which tells the motorist when his wheels are spinning on slippery roads has been developed by a Swedish engineer, Helge Ceder of Stockholm. The system adjusts automatically for road conditions and engine output.

In operation, one of the driving wheels of a car and one of the free-rolling wheels are equipped with magnets. These produce electric impulses in induction coils mounted on the car. The impulses are amplified to form a series of pulses, the frequency of which is proportional to the rotating speed of the wheels.

The pulses are integrated and fed into a differentiator, the outgoing signals of which tell the difference in rotating speed between the driving wheels and the free-rolling wheels. This difference represents the amount of the skid. When the skid exceeds a preset limit, the driver gets a signal at the same time as the gas is reduced. The permissible limit of wheel spinning is controlled by the accelerator, which means that it is dependant on speed, acceleration and the degree of ascent.

The system may be further developed to include control of the brakes to attain optimal braking effect, the inventor says. The device can also be used as a speedometer and a speed limit indicator. A patent is pending.

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