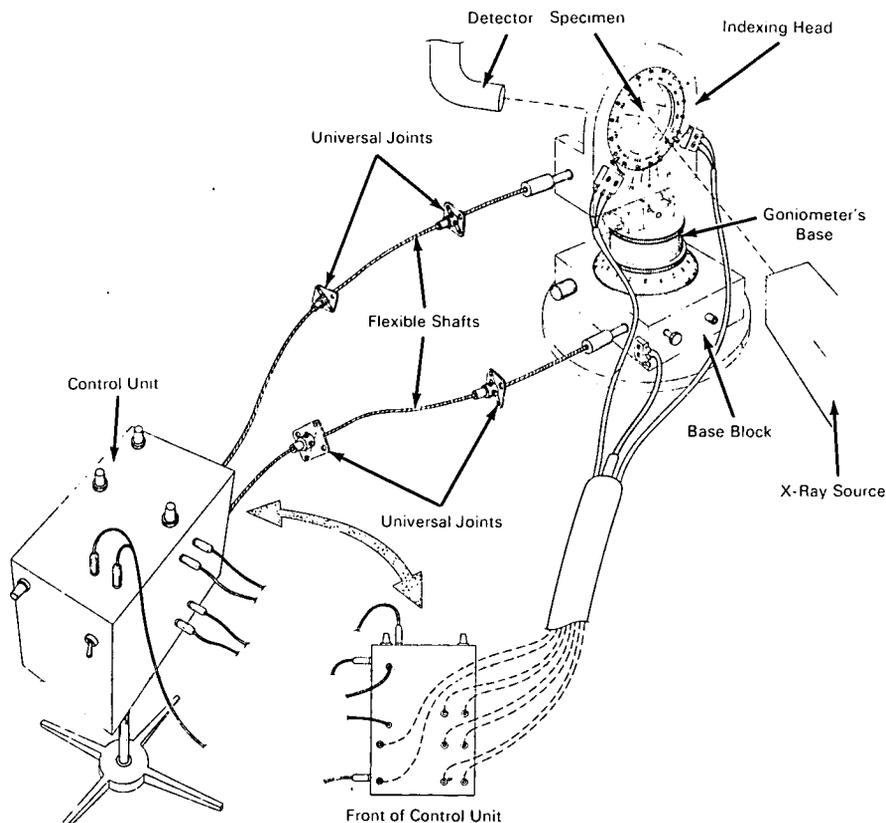


NASA TECH BRIEF



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Preferred-Orientation Analysis of Polycrystalline Materials



The problem:

Development of a faster, less laborious, and cheaper method for examination of characteristics of polycrystalline materials, and determination of preferred orientations of crystallites. The available method entails constant attention by an operator and is lacking in definition.

The solution:

A novel automatic device built around a goniometer. Mounted on the goniometer the specimen is auto-

matically rotatable in each of two planes; a control circuit regulates the sequential rotation. There is a fixed x-ray source in conjunction with a detector for examination of the material.

How it's done:

The base of the goniometer, which is graduated in degrees and can rotate about its vertical axis, is mounted on a base block; the gradations indicate the azimuth of viewing of the material. The specimen is mounted in the center of the indexing head whose

(continued overleaf)

inner periphery is gradated in degrees for indication of the specimen's rotation about the head's horizontal axis. Flexible shafts from two motors in the control unit rotate the indexing head about its horizontal axis, and the goniometer's base about its vertical axis. The x-ray source and the detector cooperate in determination of the point for a preferred-orientation analysis for a preselected atomic plane.

The device provides rotation about the vertical axis by 1° increments, as well as rotation about the horizontal axis. As a check on possible uneven rotation, or variation in speed of the chart on the recorder, pins are spaced 10° apart around the gradated face of the indexing head; the pins actuate a pair of switches that transmit signals to the control unit. Rotation about the vertical axis is checked similarly. This feature is essential for high-resolution pole-figure work.

The instrument automatically produces information that can be interpreted after removal of the specimen from the goniometer. The record of the measurement for determination of the preferred orientation of the material is permanent. This is so because a degree marker, when correlated with the information from

the detector, indicates on the chart the point at which preferred orientation occurs, since the critical movement of the chart and digital print-out system is controlled correlatedly.

Notes:

1. Engineers working with ceramics or glass and mineralogists may be interested.
2. Documentation is available from:
Clearinghouse for Federal Scientific
and Technical Information
Springfield, Virginia 22151
Price \$3.00
Reference: TSP69-10336

Patent status:

This invention is owned by NASA, and a patent application has been filed. Royalty-free, nonexclusive licenses for its commercial use will be granted by NASA. Inquiries concerning license rights should be made to NASA, Code GP, Washington, D.C. 20546.

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