

NASA TECH BRIEF



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Ratio Matching of Half-Bridge Weldable Strain Gages, Computer Program

The problem:

To develop a reliable method of making bridge arrays for measuring structural and thermal loads on test specimens.

The solution:

Half-bridge weldable strain gages are particularly adaptable to use in a thermal environment, making it desirable to avoid the addition of dropping resistors in a bridge circuit in order to match bridge arms. This program presents a method for reducing the unbalance of weldable half-bridge strain gage installations.

How it's done:

Low or zero output is a desirable characteristic of strain gage bridges mounted on unstressed structures. This can be achieved by using equal resistance gages for each strain gage in the bridge. An analysis of the wheatstone bridge circuit shows that electrical balance is obtained when the product of the opposite resistance arms is equal. Weldable half-bridge strain gages consist of two adjacent bridge resistances combined in the same package. It is possible to categorize these gages according to resistance ratio. Near-zero unstressed output is obtained by using two half-bridge strain gages when the resistance ratio of one half-bridge gage closely matches the corresponding resistance ratio of the second half-bridge gage.

Each half-bridge gage is measured to determine each resistance to within 0.001 ohm using a digital

ohmmeter. The results of these measurements are coded on data processing cards along with gage identification information.

The program calculates the two resistance ratios of each half-bridge gage and outputs a table of gages ranked according to resistance ratio. The tabulation also includes the measured resistances and both calculated ratios, thereby forming a convenient record of gage characteristics.

For a particular installation, two adjacent half-bridge gages are selected from the computer tabulation. An adjacent half-bridge gage may be reserved in the tabulation as a spare in case one gage is inadvertently destroyed.

Notes:

1. This program was written in the FORTRAN IV language for use on the IBM 7094 computer.
2. The program is capable of handling up to 500 half-bridges.
3. Inquiries concerning this program may be directed to:

COSMIC
Computer Center
University of Georgia
Athens, Georgia 30601
Reference: B69-10040

Patent status:

No patent action is contemplated by NASA.

Source: Karl F. Anderson and Gary L. Brown
(FRC-10032)

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PLASMA THERMAL ANALYSIS (PTA) is a technique for measuring the thermal stability of polymers. It is based on the principle that the weight loss of a polymer sample during heating is proportional to the amount of polymer that has been degraded. The technique is particularly useful for the study of the thermal stability of polymers in the presence of oxygen and moisture.

Radio Frequency (RF) Plasma Treatment of Polyethylene

The purpose of this study was to investigate the effect of radio frequency (RF) plasma treatment on the surface properties of polyethylene. The plasma treatment was carried out in a radio frequency glow discharge reactor. The results show that the plasma treatment significantly increases the surface area and changes the surface chemistry of the polyethylene. The treated surface is more hydrophilic and has a higher surface energy than the untreated surface. These changes are attributed to the formation of oxygen-containing functional groups on the surface of the polyethylene.

The plasma treatment was carried out at a power density of 100 W/cm² for a period of 10 minutes. The surface area of the polyethylene increased from 1.0 m²/g to 1.5 m²/g. The surface energy of the polyethylene increased from 30 mJ/m² to 45 mJ/m². The surface chemistry of the polyethylene was analyzed by X-ray photoelectron spectroscopy (XPS). The results show that the plasma treatment increases the concentration of oxygen and carbon on the surface of the polyethylene.

The plasma treatment was carried out at a pressure of 0.1 Torr and a frequency of 13.56 MHz. The surface area of the polyethylene increased from 1.0 m²/g to 1.5 m²/g. The surface energy of the polyethylene increased from 30 mJ/m² to 45 mJ/m². The surface chemistry of the polyethylene was analyzed by X-ray photoelectron spectroscopy (XPS). The results show that the plasma treatment increases the concentration of oxygen and carbon on the surface of the polyethylene.

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