

DETERMINATION OF MATERIAL CONSTANTS BY PRECISE LASER DEFORMATION MEASUREMENT

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ABSTRACT

The properties of material can be understood by obtaining its material constants. Due to the complication of measuring environments, the traditional measurement technique of material constants is difficult, especially in high-temperature measuring environment.

This study offers a precise technique of laser deformation measurement to determine the various material constants under the condition of high-temperature. It is based on Laser Speckle Photography, which is used to measure the displacement of three different kinds of metal materials in variable temperature. In this way, we can overcome the harsh condition of high-temperature measuring environment. The displacement data gained is then transformed into the strain data. The acting forces inflicted on the specimen is measured by the counter weights. Afterward, the inflicted strain force, along with the section area of the specimen, is once again transformed into strain data. Finally, the elastic constants of the isotropic materials are immediately obtained.

The initial experimental results are satisfactory in the civil engineering. If the sources of error are rightly corrected, the precision of the material constants will be greatly enhanced. Compared with the traditional contacted method, the technique has the advantages of easily-setup, non-destruction, the lower requirement of base isolation and high-precision. Especially, the technique not only can be wholly monitored but also achieves a breakthrough concerning the measuring difficulties of high-temperature environment.

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