

Development of a Lab Scale Dynamic Mechanical Analyzer

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Dynamic mechanical properties refer to the response of a material when it is subjected to a periodic strain. Dynamic mechanical analysis (DMA) is an important technique used to measure the mechanical and viscoelastic properties of materials such as thermoplastics, thermosets and elastomers. The aim of this research is to study the Dynamic Mechanical behavior of elastomer compounds by developing a lab-scale dynamic mechanical analyzer. The apparatus was designed to record a test specimen's reaction force when a systematically varying gradual strain development is applied. The phase difference between the applied strain and the material's response in terms of force was used to estimate the storage modulus and loss modulus to analyze the material properties. Furthermore, the dynamic modulus, dynamic loss modulus, and the mechanical damping coefficient of the elastomer could be estimated using the developed dynamic mechanical analyzer.

The values obtained using the developed apparatus showed a fairly good agreement with the values for the same compound obtained from Prescott instruments ODR. The deviations were within 3.5%. One of the major shortcomings of the apparatus was the fact that the operating frequency was limited to 1Hz and there is no provision for carrying out measurements in varying temperature conditions.

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