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Large Deformation Analysis of Rubber by Software Fusion 360

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Abstract: ***This paper articulates you the large deformation procedure of a rubber sheet. Nowadays, material selection of a component is very important as per the trend and compact ability, materials like rubber nitrile, rubber silicone is considered for the structural analysis of rubber. By the application of Fusion 360 software with the boundary conditions, the parameters like stress, strain and deformation is known for the specific material.***
Keywords: Fusion 360, rubber, silicone, nitrile, stress, strain, deformation.

I. INTRODUCTION

Rubber is an elastic material which is extracted from the various plant resources. It has a large industrial usage, which is used for multiple purposes. Specially, in the medical sector it is used rapidly in form of gloves, masks and patient body fixtures. And also in the automobile sector it is used in the form of tires, belts in the engine and electrical plugs.

II. PROCEDURE

1) For designing the rubber of cylindrical shape, the following dimensions are taken generally.(as shown in Fig.1)

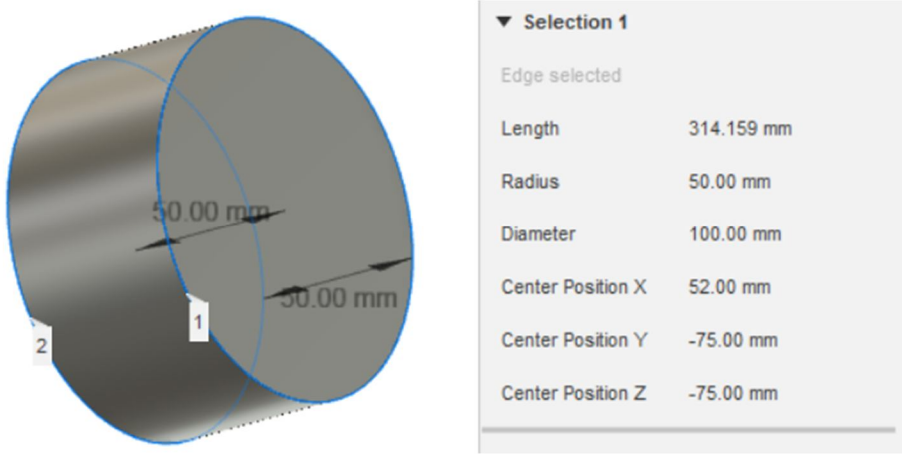

Fig. 1

2) The solid part of rubber which is designed in fusion 360 is shown in the Fig. 2

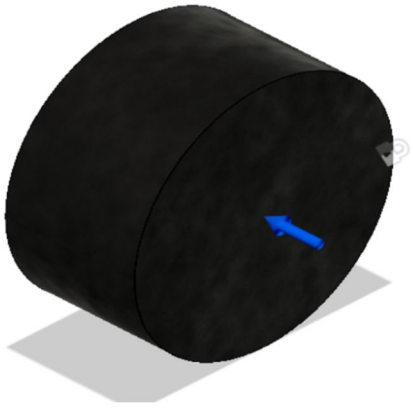

Fig. 2

3) Generally, rubber material that is used in medical sector is nitrile due to its high tensile strength and excellent wear and abrasion resistance, where when you look at external applications specially silicone rules the world which can operate at higher temperature of 230 ^{o}c.
4) Now, after designing the model of rubber, the simulation (static structural analysis) is done by applying a load of 10^{7} on one end of the designed part as shown in Fig.2 .
5) The following figures are the simulation pictures of various materials that have been considered.

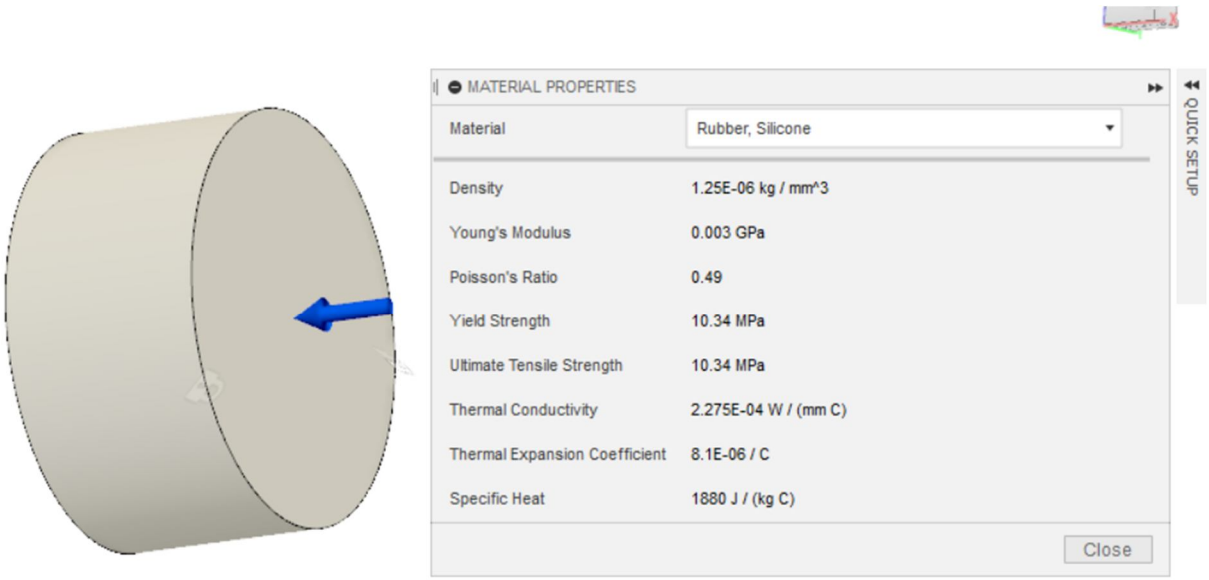

Fig. 3 Properties of rubber silicone

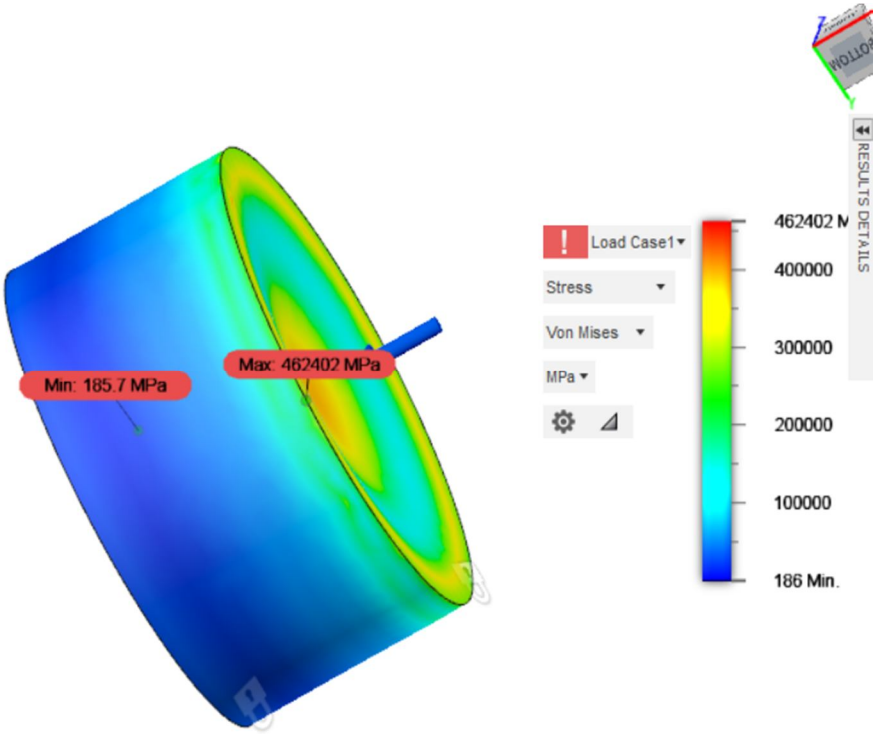

Fig. 4 Stress in rubber silicone

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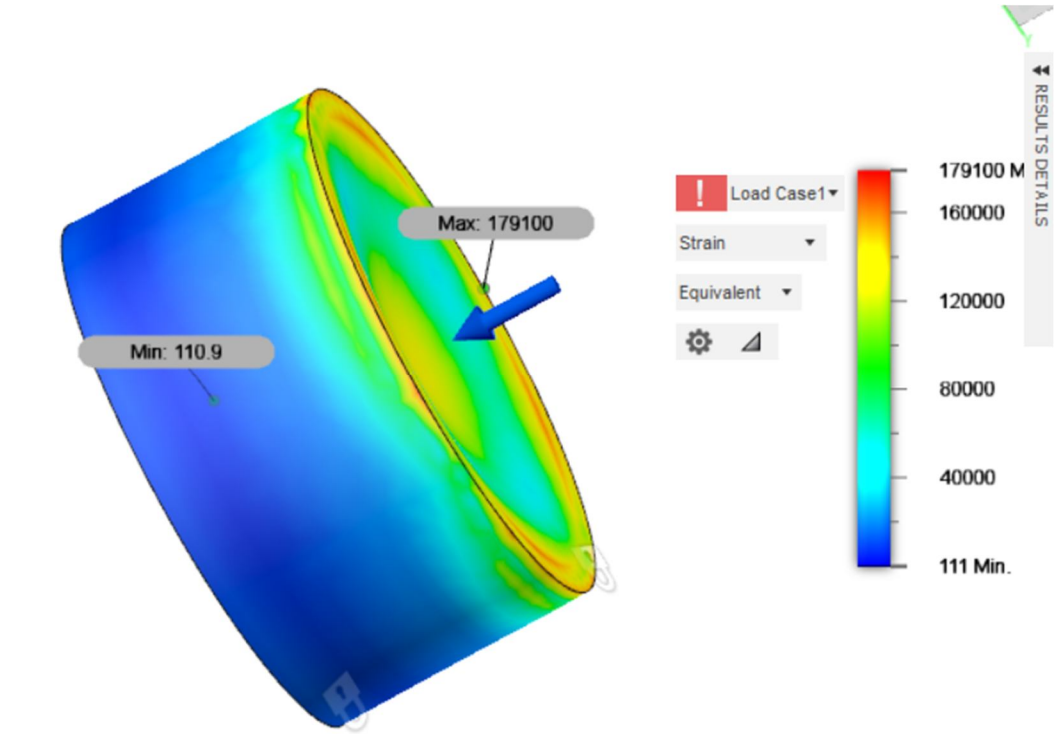

Fig. 5 Strain in rubber silicone

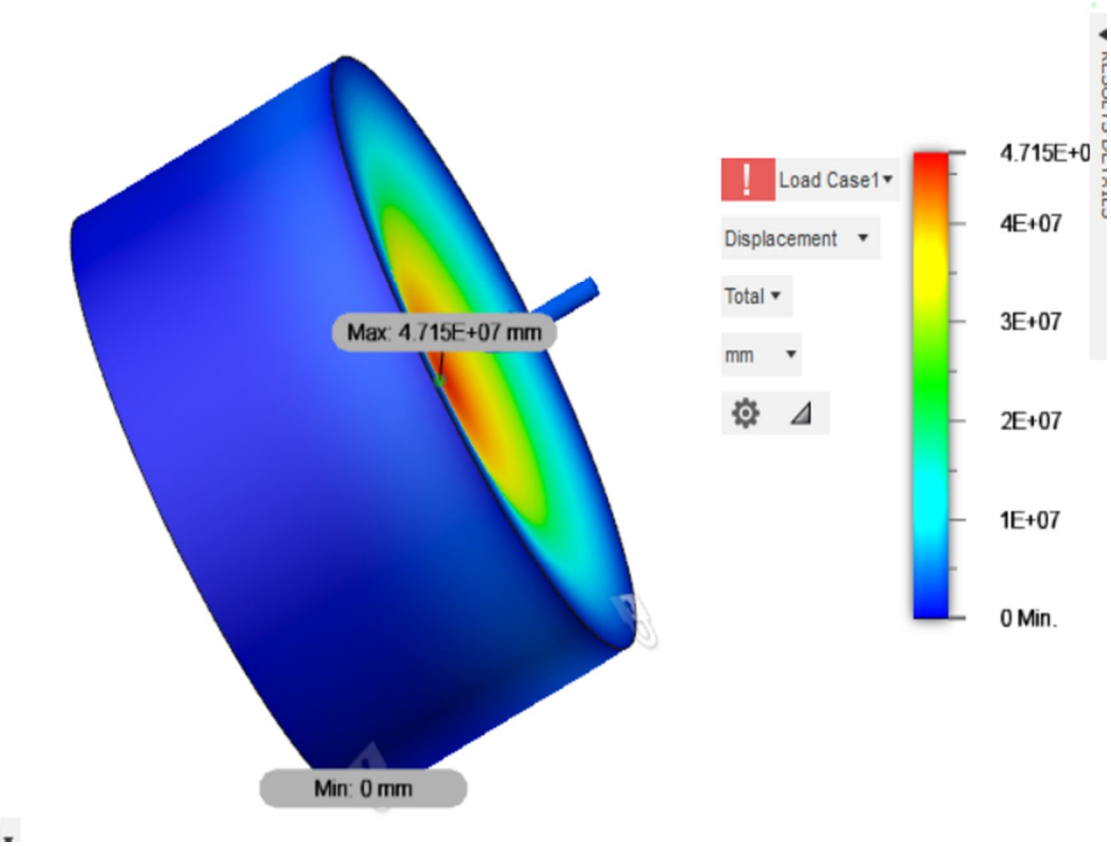

Fig. 6 Deformation in rubber silicone

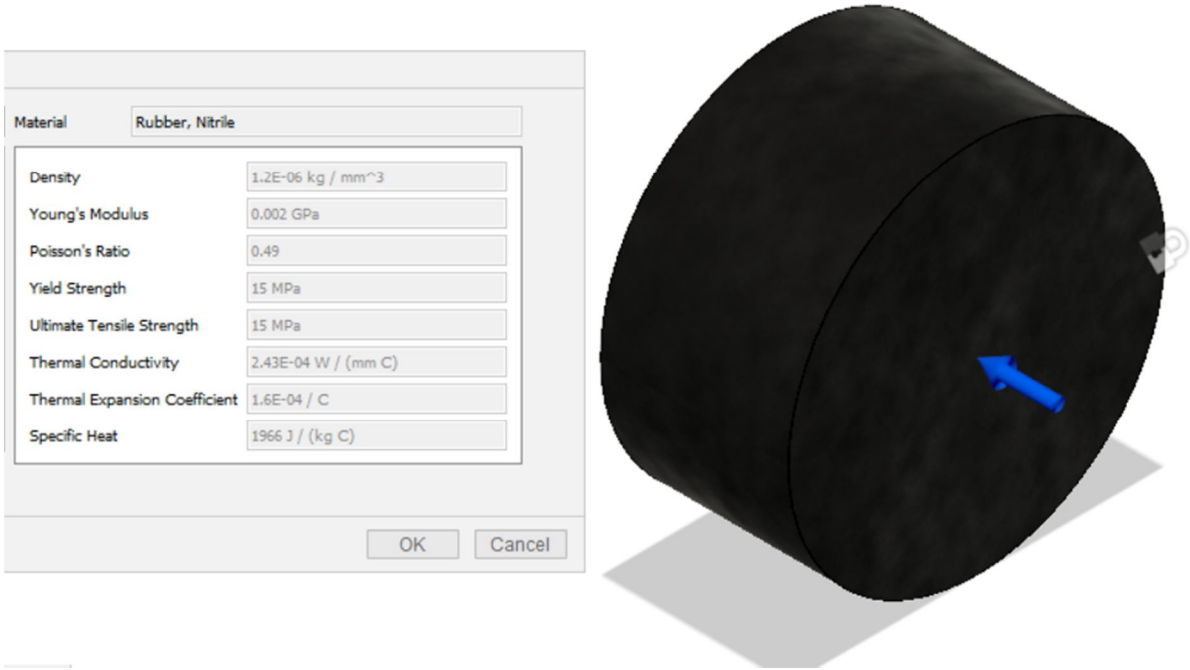

Fig. 7 Properties of rubber nitrile

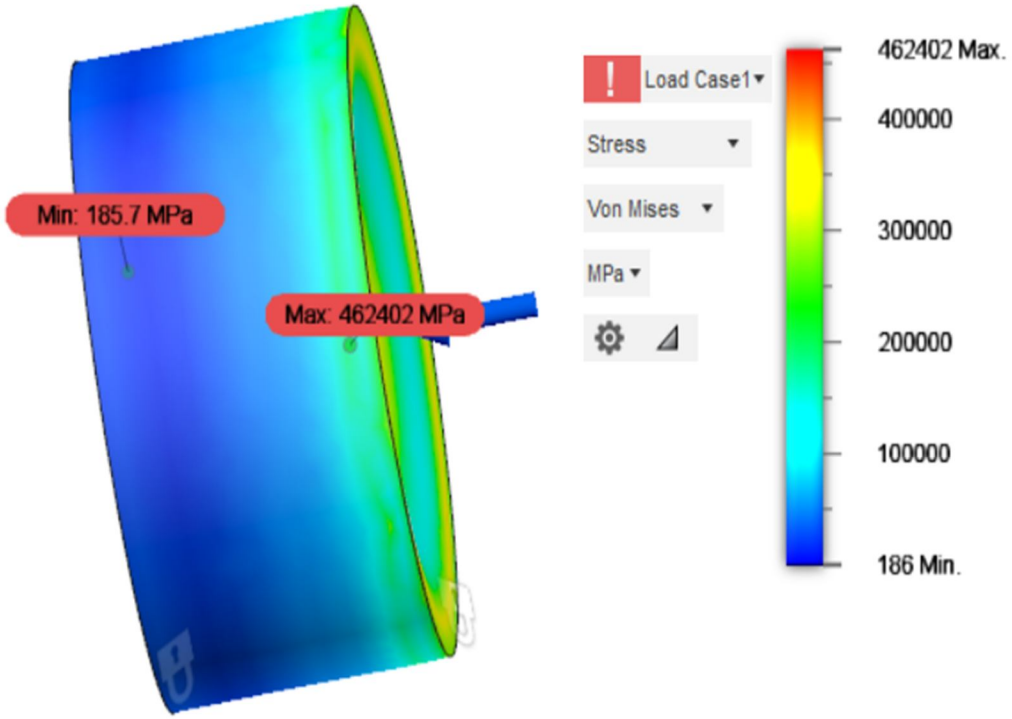

Fig. 8 Stress in rubber nitrile

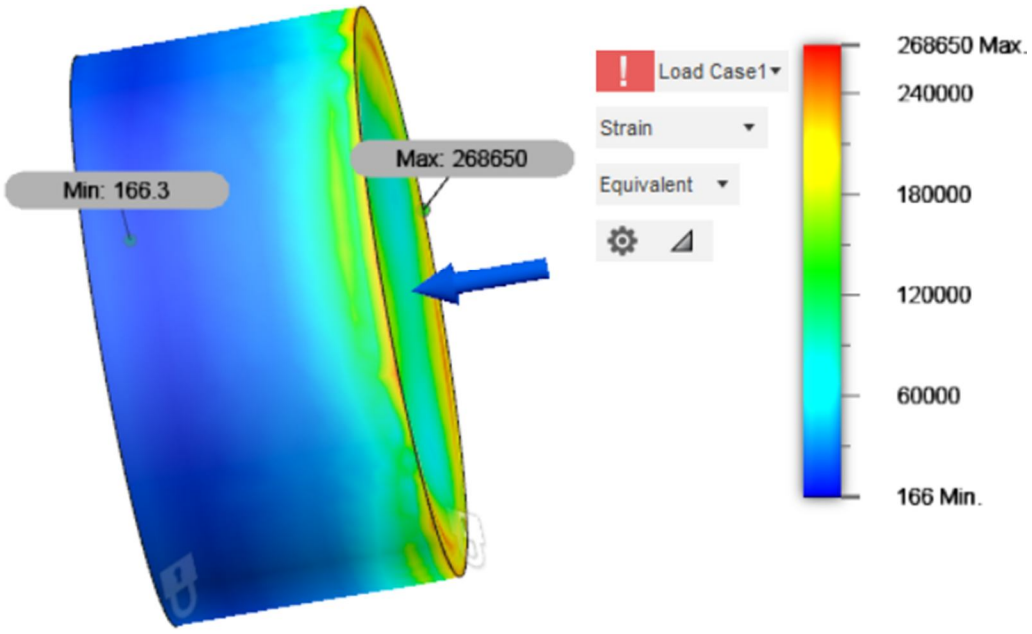

Fig. 9 Strain in rubber nitrile

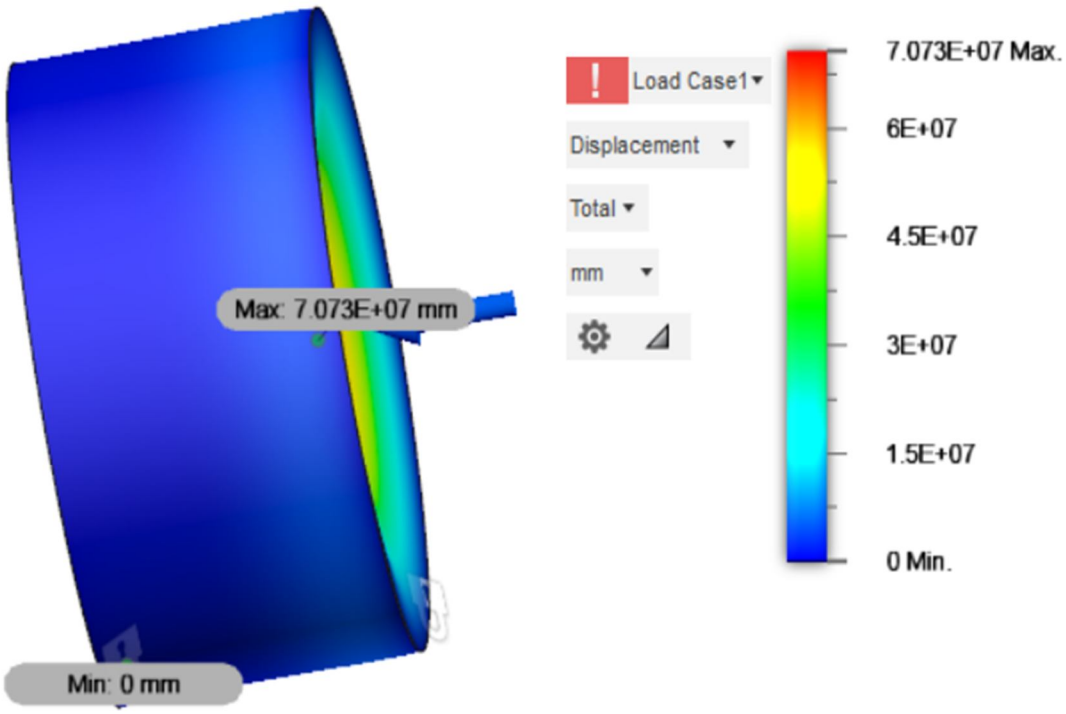

Fig. 10 Deformation in rubber nitrile

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III.RESULTS

A load of 10^7 MPa is applied (which is completely meshed). The following are the results obtained from the simulation performed in the software Fusion 360 :

Material	Stress (MPa)	Strain (mm/mm)	Deformation (mm) * 10^7
Rubber Silicone	462402	179100	4.715
Rubber Nitrile	462402	268650	7.073

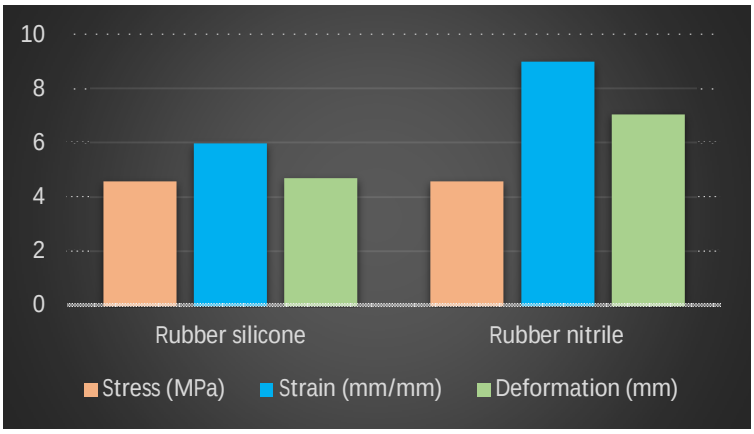

Fig. 11 Comparison of stress, strain, deformation of different materials

IV.CONCLUSIONS

The project mainly focused on simulation as it helps the engineers to figure out the material which can be used to their constraints. The obtained results also determines why nitrile and silicone rubbers are used specially in definite streams. Generally, materials undergo elastic and plastic deformation as the results show stress, strain and deformation it helps the manufactures to what extent a particular material of rubber is used in our day to day life (cosmetics, package bands, shoes, wet suits, specially made belts).

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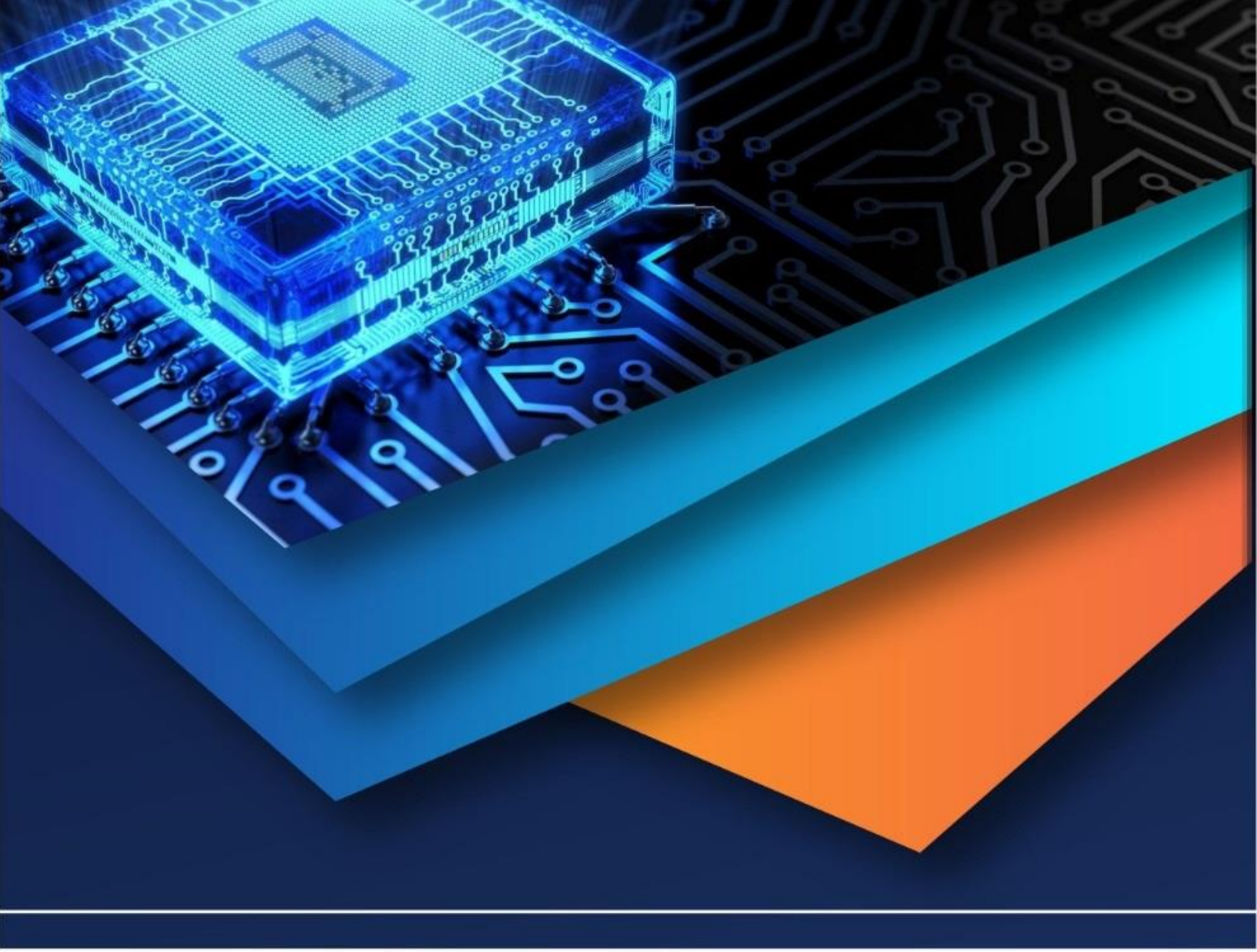
[3] "Application on endochromic plasticity on simulation of technical rubber components" , Herbert Baaser, Christian Heining.



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