ABSTRACT

Microneedle is a drug delivery technology that was created to minimize the patient's fear of the drug delivery system by medical personnel, as well as providing comfort to patients in administering drugs. Microneedle has a structure in the form of a micro-sized needle which has been suggested as a biomacromolecule conductor with the material used is silicon (Si). Before doing the fabrication, researchers need some reference in the form of simulations so that the expected parameters are not too far away. COMSOL Multiphysics is an application that can be used as a simulation and design of microneedle to determine the resistance and strength of the microneedle. In this study, the authors designed and simulated 3 microneedle geometries with variations in tip tip sizes, namely 20, 25 and 30 m and a given force of 0 – 2 mN In the stationary analysis carried out, namely by displaying the results of low stress and displacement to the epidermal layer. Buckling analysis there are 3 studies carried out, namely by displaying the values of axial load, buckling load and load banding. In the bending resistance test, a preasure was given as large as the skin insertion force of 3.18 MPa, and in the buckling load analysis there was a critical load factor value, the needle was said to be safe, no bending occurred if CLF>1. Geometry recommendations were obtained in this study, namely geometry II with a tip diameter of 20 μm displaying a stress value of 7.7 x 106 N / m^2 with a displacement of 192 μm when given a force of 1.6 mN in the stationary study. In the axial load analysis, it produced a value of 2.62 X 106 N / m2 with a critical load factor value of 4243.3 where CLF>1 it was said to be safe and there was no bending in the buckling study analysis, and yielded a critical buckling force value of 16.95828 N from the result of Fskin multiplication. As well as the result of the bending value which is 1.7 X 10^7 N / m^2

Keywords : *Microneedle*, *epidermis*, *transdermal*, *COMSOLMultiphysics* 5.5, *silicon.*