ABSTRACT

Flexible electronics is an electrical device using flexible substrate in which a conductive or a semiconductive material is deposed on it. Due to capability of changing its geometry, flexible electronics has many applications, such as elastic sensor or bendable devices that can be put on clothing or human's organ to examine human body performance. To apply flexible electronics into devices, it is important to understand the effects of mechanical tensile force to the mechanical and electrical properties of the material. The material should be able to maintain its elasticity, physical properties, as well as electrical properties after experiencing mechanical tensile forces for many times. Considering to this issue, a mechanical test instrument has been designed and built to characterize the mechanical properties of flexible conductive material and to study the correlation between mechanical and electrical properties of the material. The instrument is integrated to digital microscope so that any physical changes of the material including any possible damages after mechanical stretches are observed. The instrument is able to generate a maximum force of 26.59 N and a maximum displacement of 40,00 mm. The smallest variation of the mechanical force and displacement are 0.14 N and 0.02 mm, respectively. The instruments is able to generate a maximum force of 2.16 N on 6.50 x 3.80 x 0.17 mm PET. This force triggers a maximum stretch of 0.16 mm. The smallest stretch is 0.01 mm. This mechanical stretch affects the material resistance. The resistance of silver paste deposed on top of PET is observed to be relatively constant when 0,10% strain is applied. However, this resistance changes about 10,00 Ω when 1,00% strain is applied. Less resistive material is observed to be more stable against the mechanical strain.

Keywords: *Flexible electronics, flexible conductive material, PET, tensile test instrument*