

Simulation and Performance Analysis of Nanowire Design with Different Variants

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Introduction: The nanowires offer an eminent prospect of thermal sensitivity and rapid detection with the ability to incorporate nanowires into the mobile phone surface, but it is limited by the difficulty in manipulating and localizing the nano probes into the mobile phones & computers. These communicate with the base station of the nanowire using radio frequency (RF) radiation. If RF radiation emitted from the electronic gadget proliferates, it will have an appalling effect on both the human body and also on the mobile façade. Mobile phones thermal sensing with nanowires could resolutely convey a real-time data with the aspect of minute size and economical cost.

Results: The analysis is explained with the help of temperature properties like total displacement, total deformation, surface deformation and temperature gradient. In here, the thickness of the nanowires Al, SiO₂, Si(c) is varied to underneath the preeminent thickness nanowire for the best possible sensitivity. It is clearly seen that conductive material Al has the higher total displacement values among other two semi-conductive and insulative materials of nanowire.

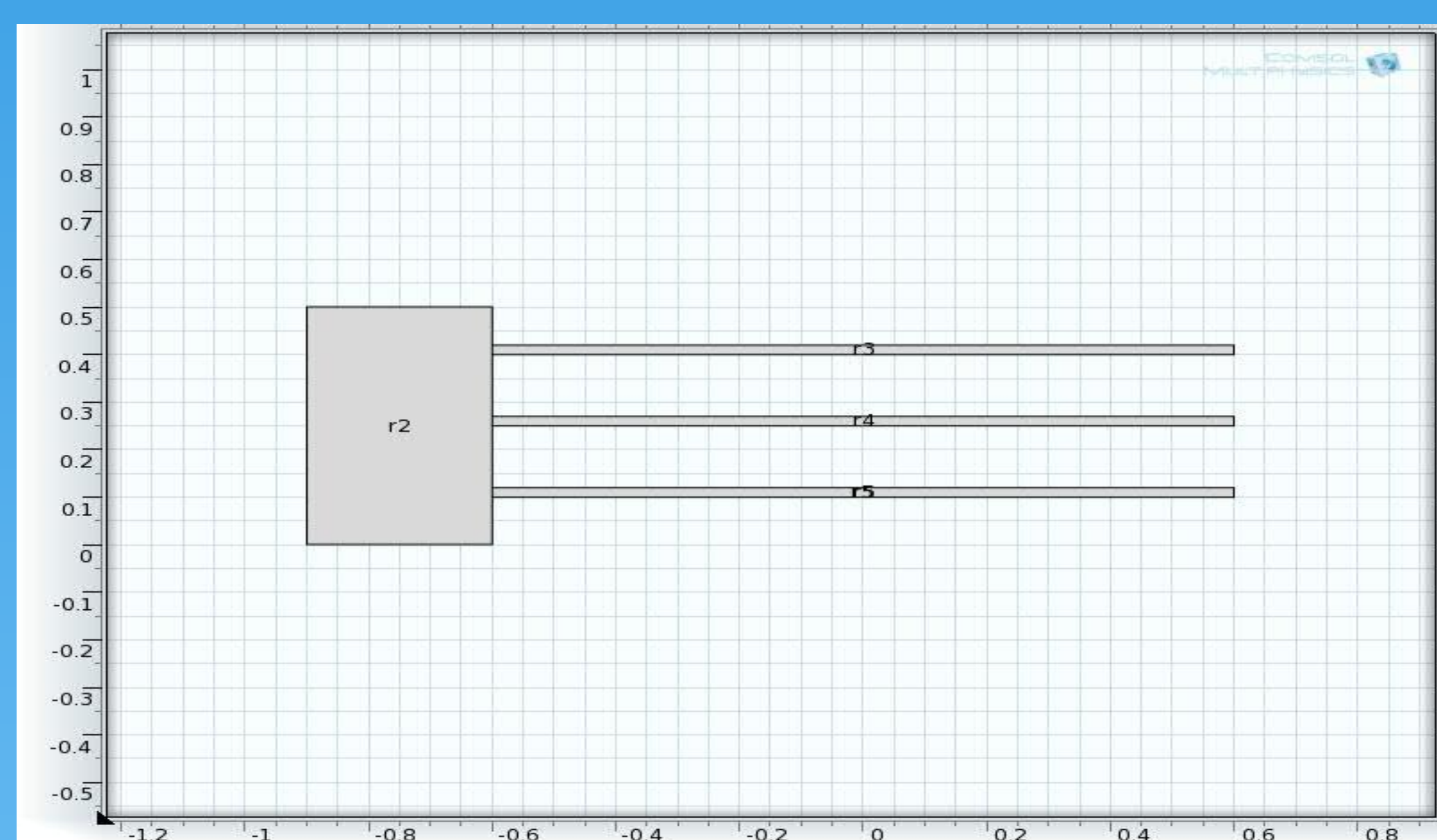


Fig.1. 2D Model

Computational Methods: To devise a highly responsive nanowire, it is essential to impound a maximum amount of heat on the surface of the mobile device and minimize the heat scattering into the bulk of the substrate. For this, a waveguide layer made of a conductive material is used to confine the heat energy close to the surface of the device. Since, the conductive materials are an exceptional heat absorbing tools, they are the most fancied rudiments for carrying out this manoeuvre.

$$Q=m*c*\Delta T$$

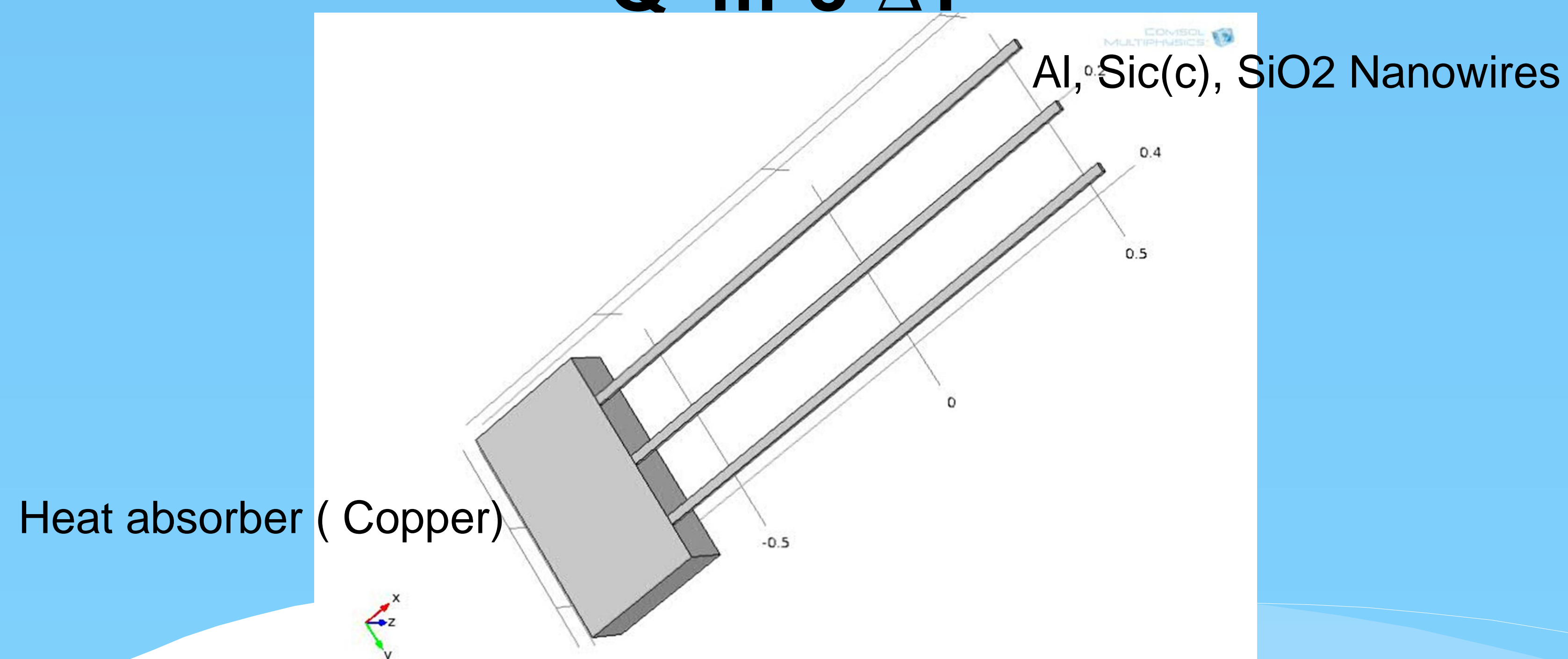


Figure 2. 3D Model

The inter digitated copper material placed on the top of the mobile surfaces is mandatory for receiving the thermal sensations from the gadget.

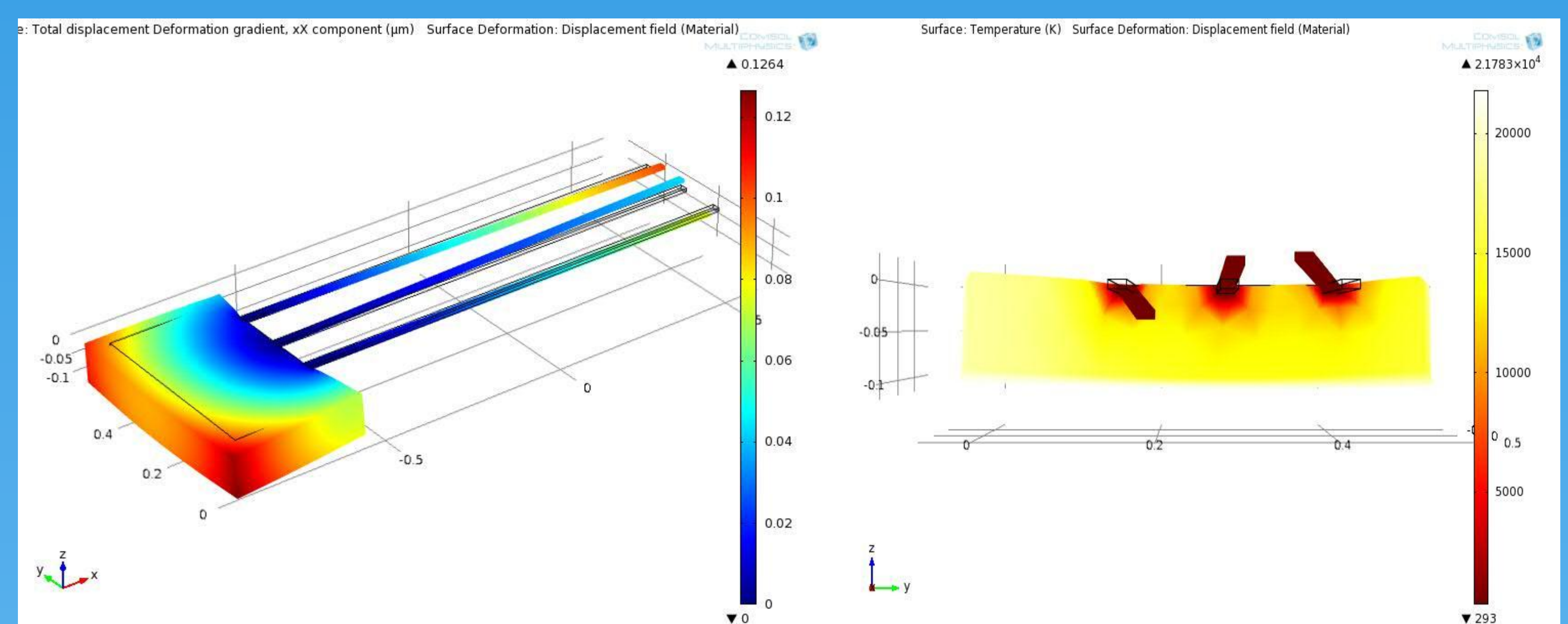


Figure 3. Displ Gradient

Figure 4. Temp Gradient

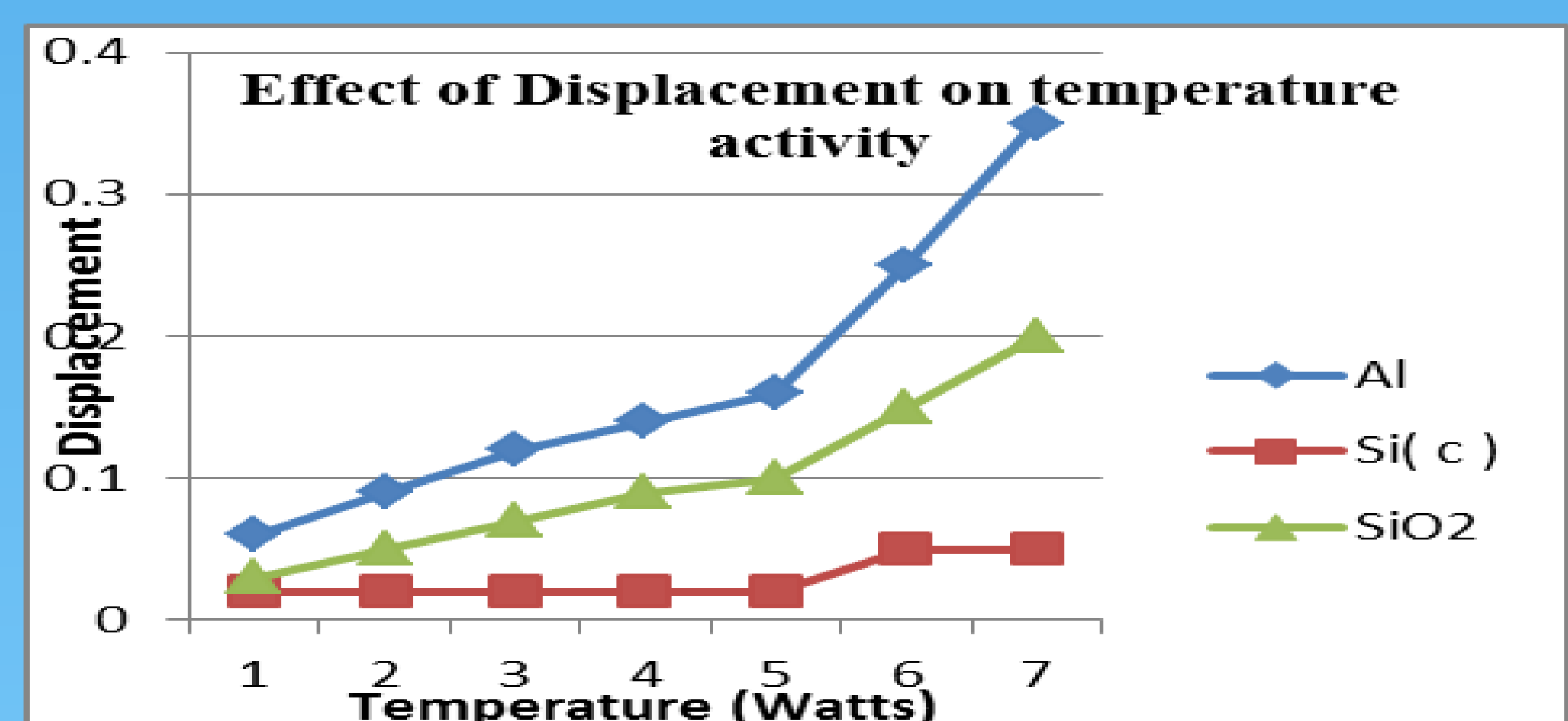


Figure 5. Temp vs disp

Conclusions: This system shows higher sensitivity in Al and it prevents the energy loss into the bulk substrate. Hence different materials of nanowire show different sensing and displacement performance after being exposed to the heating surfaces of the mobiles and computers. Hence the developed sensor is used to detect the surface temperature of the mobile phones and computers very proficiently with enormous sensitivity than all other existing reports for nanowire based temperature sensor.

References:

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