

Design and Analysis of CO₂ Sensor using COMSOL Multiphysics

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Introduction: This paper gives the brief description of CO₂ sensor modeling using COMSOL Multiphysics. These sensors are inexpensive, highly selective and sensitive. We found the results of CO₂ sensor electric potential variation at 350°C temperature with high reliability using less power.

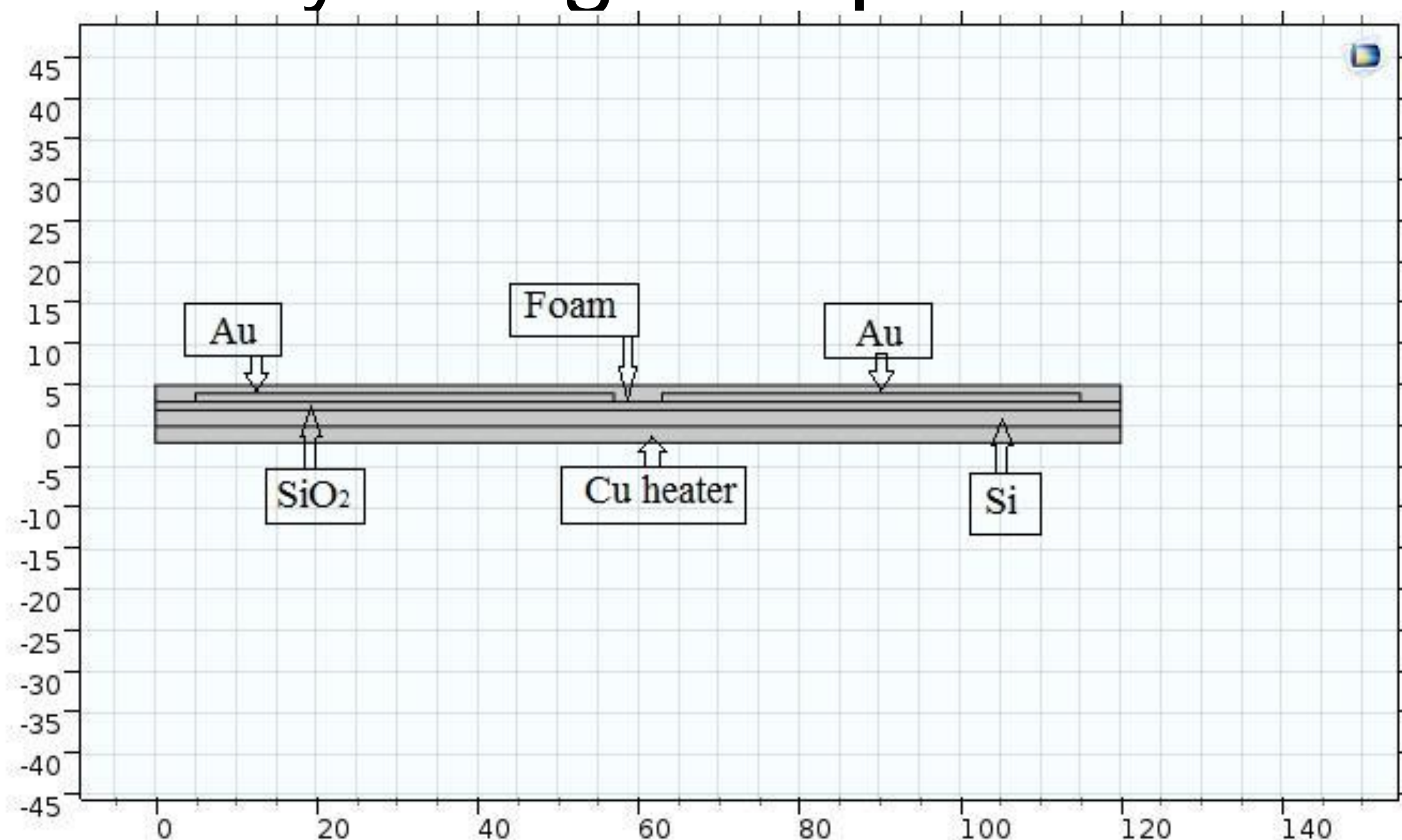


Figure 1. Geometry and Dimensions of the CO₂ sensor

Boundary Conditions: Describe your approach to the problem at hand. It might be a good idea to show the important equations that you are solving for. You may also refer to the physics interfaces that you used for the simulation.

$$\rho\omega^2 u - \nabla \cdot \sigma = Fv$$

$$\nabla \cdot D = \rho_v$$

$$E = -\nabla V$$

The fig.2 shows the surface potential distribution in layered 2D view. The 350°C temperature heater is placed at the bottom boundary of the sensor.

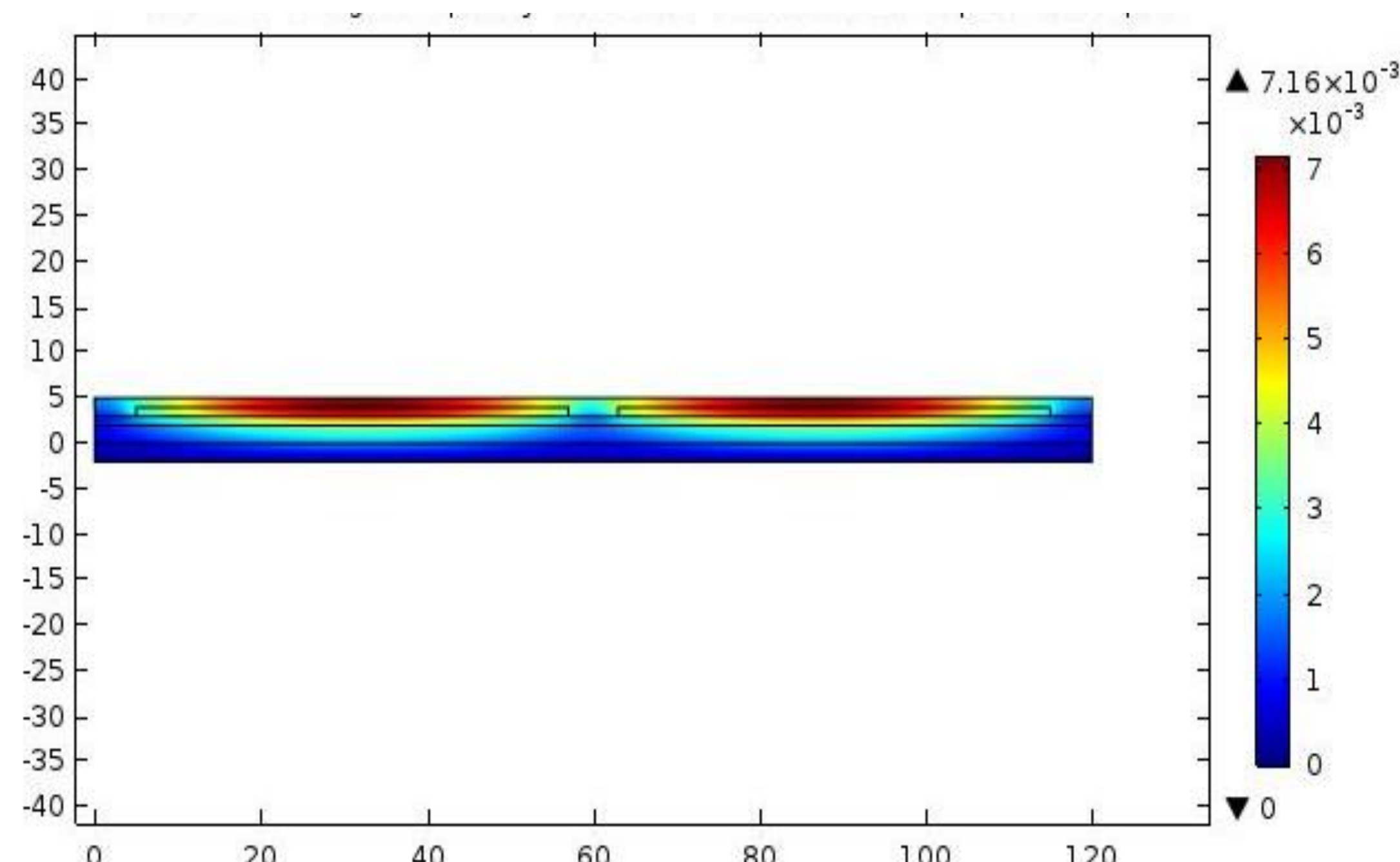


Figure 2. Surface potential distribution

Results: The 350°C temperature heater is placed at the bottom boundary of the sensor. The copper material decreases the overall cost of the sensor. The optimum design is simulated and its deformation effect is shown in fig. 3.

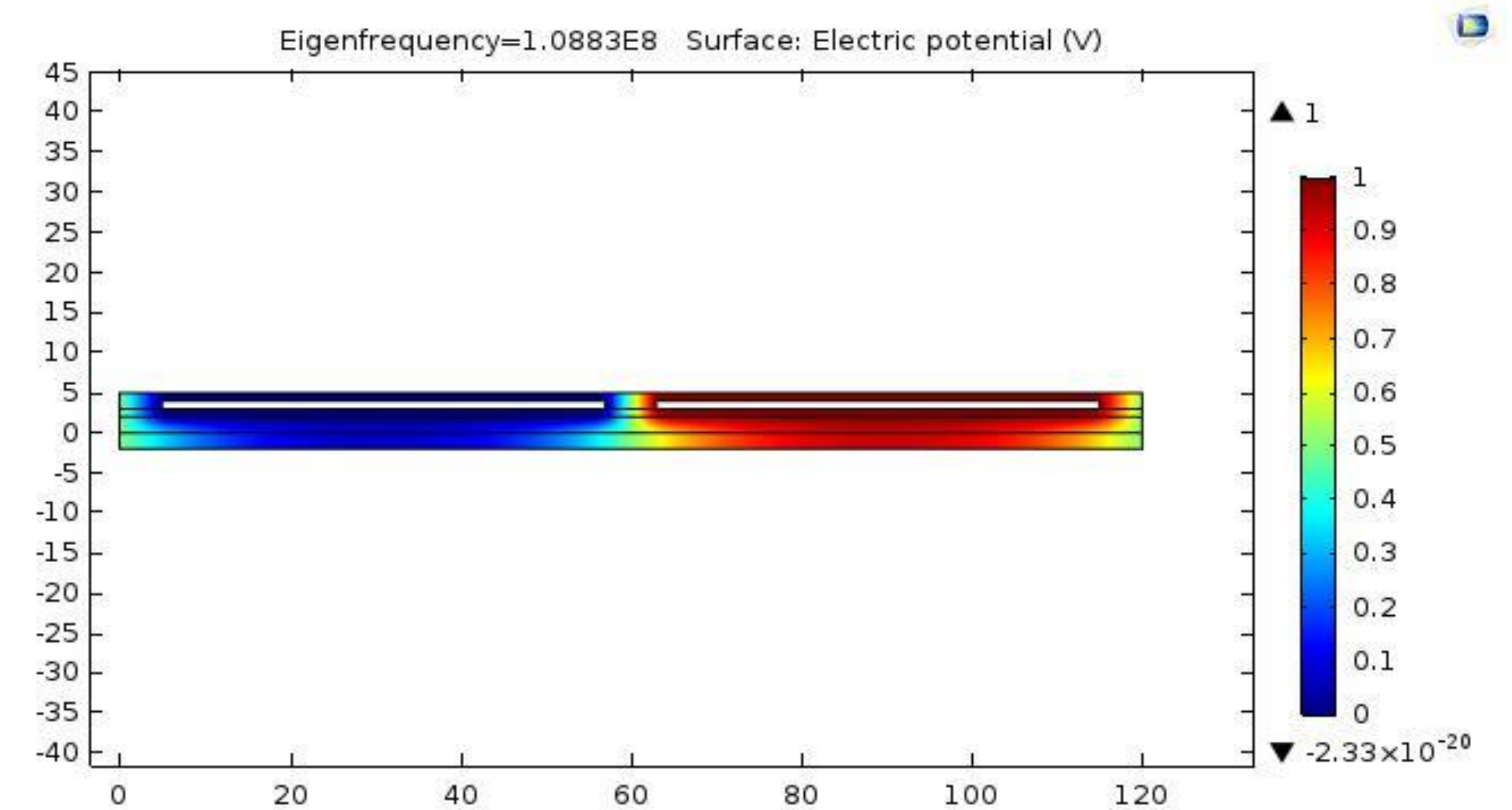


Figure 3. Electric Potential distribution

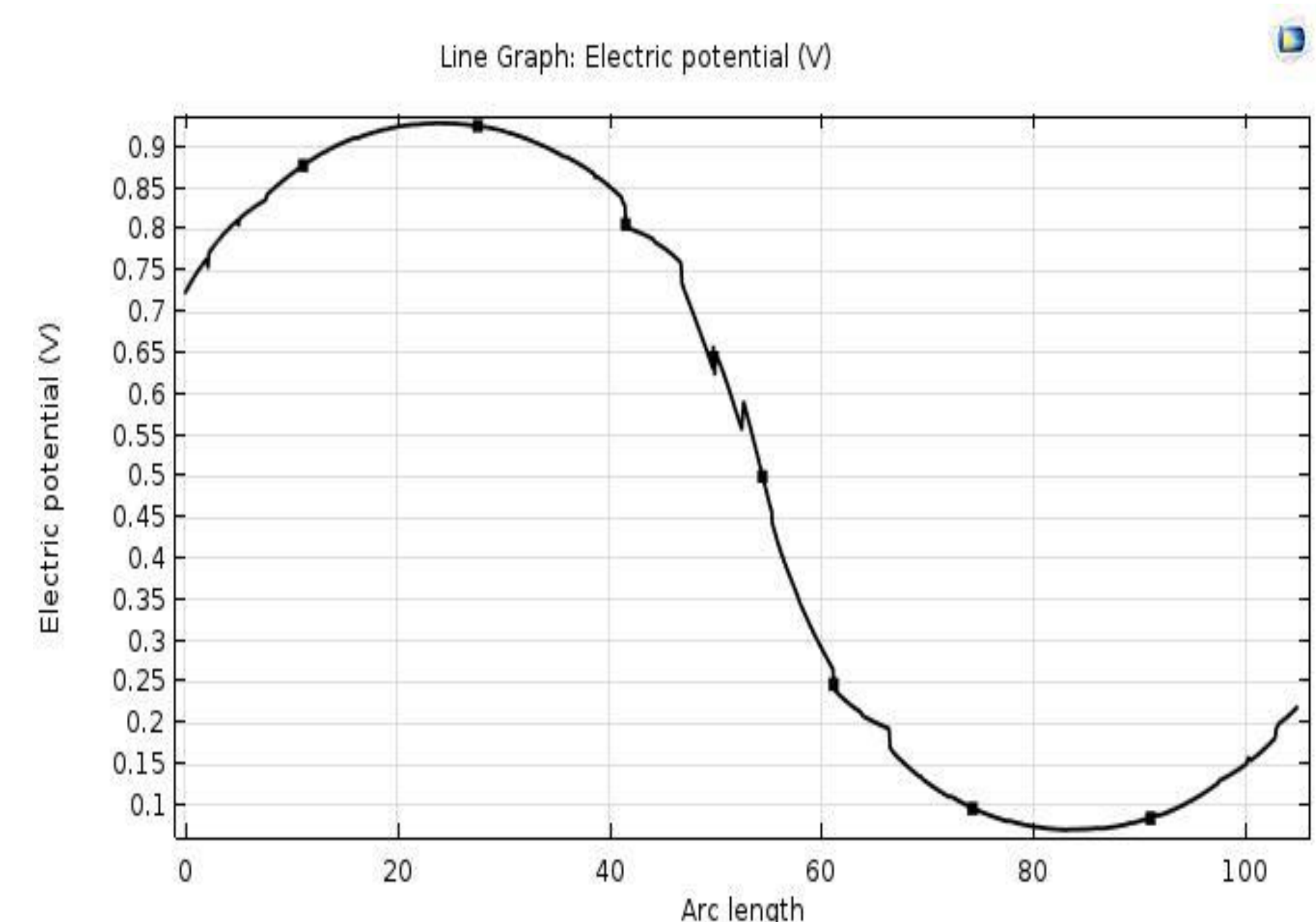


Figure 4. Electric Potential Vs Arc length

Conclusions: It is observed that the sub-millimeter structure is deformed due to the potential variation in CO₂ sensor. The surface potential variation is observed and its variation along the arc length is plotted. Also the copper heater has better thermal conductivity and it will reduce the cost of sensor.

References:

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