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An analysis of sensitive material (silicon-germanium-oxide) using in uncooled microbolometer

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Microbolometer is a device used as a thermal sensor in a thermal camera or a night vision camera. The most important part of the microbolometer is the sensitive material that was prepared by radio frequency (RF) magnetron sputtering thin film of silicon-germanium-oxide. To optimize the performance of the microbolometer, we need to find the best sensitive material that has a high temperature coefficient of resistance (TCR) value, low resistivity, and low noise. In addition, if we can find a good sensitive material that can detect even a slightly change of temperature, we will have a better quality picture from the thermal camera or a night vision camera. In our research, we used the temperature coefficient of resistance (TCR) values and the resistivity to analyze the electrical characteristic of the sensitive material. To observe the electrical characteristic of the sensitive material, we set up a circuit and increase the temperature to observe the voltage of the sensitive material at each 2 degree Celsius step, and then we calculated the TCR value and the resistivity of the sensitive material. When the sensitive material was sensing a different temperature, the sensitive material would send a different detectable signal to the device that can be used for various applications. The TCR value is directly proportional to the temperature sensitivity of the sensitive material. By varying the composition (Silicon-Germanium-Oxide) of the sensitive material, the sensitive material will also have a different electrical property. In the future, we need to further our research on the noise measurement.