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Case ID:M13-193P
Published: 3/4/2014

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Low Temperature Process to Make Copper Germanide Thin Film (Cu3Ge) Contact and Metallization

Copper Germanide (Cu3Ge) is an exceptional material to use in electronic devices due to its low resistivity. Unfortunately, it is difficult to use Cu3Ge for contacts in solar cells or as interconnections with integrated circuits because its diffusion properties cause degradation of the host material during the application processes. Another issue limiting the use of copper in electronics is the high temperatures required to attach the copper to the host material. These temperatures range from 200°C to over 400°C. Most processes require 15 minutes to 3 hours in an oven to attach the copper to the host material. Higher temperatures shorten the time requirement, however, many substrates (e.g. plastic flexible electronics) are not able to withstand the intense heat requirements.

Researchers at Arizona State University have developed a process to integrate copper germanide (Cu3Ge) contacts and interconnect on a variety of substrates used for display, electronics and solar devices. The new process produces a faster attachment in approximately one minute. Additionally, the procedure only requires temperatures to reach 80°C, and will work with delicate materials such as plastics. A natural barrier layer develops on the outside of the copper germanide that protects the Cu3Ge, and prevents the Cu3Ge from diffusing into the host material. The alloy exhibits low resistivity characteristics similar to copper.

Potential Applications

- Flexible screen displays.
- Solar cells.
- Integrated circuits.
- Light-emitting diodes.

Benefits and Advantages

- Lower Costs – The process uses less energy due to its fast application rate and low temperature requirements.
- Fast Application – Simple process only takes one minute.
- Larger Market – Works with more materials including plastics.
- Better Miniaturization - Lower resistivity allows for smaller circuits.

For more information about the inventor(s) and their research, please see Dr. Terry Alford's directory webpage