Skysong Innovations
Advancing the Arizona State University Knowledge Enterprise

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Biosensor and methods of fabricating the same

Copper is an exceptional material to use in electronic devices due to its low resistivity and low cost. One drawback that limits 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. Higher temperatures can shorten the time requirement, but many substrates (e.g. plastic, flexible electronics) are not able to withstand the intense heat requirements. Additionally, the high temperatures may allow the copper to diffuse into some substrate materials.

Researchers at Arizona State University have developed a process to integrate copper and form a copper oxide contact or silver-doped copper oxide contacts that interconnect on a variety of substrates used for biosensors, flexible displays, electronics, and solar devices. The new process produces a faster attachment in less than two minutes. Additionally, the procedure only requires temperatures to reach 45°C, and it will work with delicate materials such as polymer substrates like polyethylnapthalate (PEN). A natural barrier layer develops on the outside of the copper, creating a copper oxide compound that protects the copper and prevents the compound from diffusing into the host material. The alloy also exhibits low resistivity characteristics.

Potential Applications

- Biosensors
- 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 takes less-than two minutes.
- Larger Market – Works with a wider variety of 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