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Temperature stability of decorative electro-magnetic transparent metal-semiconductor thin-films

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Electro-magnetic transparent decorative coatings with a metallic appearance are highly desirable for military, automotive and communication applications. Inherently, a metallic film interferes with electro-magnetic radiation rendering it unsuitable for these applications. Hence, metal-semiconductor alloy thin films were investigated, as their electro-magnetic transparency and optical properties can be controlled.[1] One challenge for these coatings is to maintain their properties during thermal events, either during manufacturing into a final device or as a result of environment conditions during use.
Metal-semiconductor thin films have the inherent advantage that the optical and electrical properties of the thin film can be manipulated in multiple ways. The properties of the thin films can be controlled not only by changing the alloy composition, but also by varying the deposition process parameters.
This project investigates the influence of processing parameters and thin film composition on the electro-magnetic transparency, as well as the optical properties of these coatings.
However, their suitability for high-temperature applications or processing has to be investigated. Therefore, the optical and electrical properties of these thin films have been studied for relevant process temperatures of up to 240 ℃. Their properties were analysed and compared post processing. It was revealed that after processing the thin films at relevant temperatures, the properties changed. Possible mechanisms include oxidation, phase changes, grain formation, grain size changes and changes along grain boundaries. This information will be used to select composition and process properties so that these films can be used in a number of applications.

1. Kawaguchi, T., Tahara, K. & Saga, T. Radio wave transmitting decorative member. U.S. Patent 9,187,820 (2008).

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