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Title: Effect of nanometric and micronic particles size on physical and electrical properties of graphite thick film

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Abstract: Precise control and design of the microstructure of active layers in thick films is essential as it has a profound impact on the overall thick film properties. This includes the particle size effect of the starting material which forms the active layer of the thick film. Given the fact that nanosized particles have distinct properties from their bulk counterpart, the effect of the size of graphite starting material towards the formation of thick film graphite and its properties is worthwhile studying. Herein, we report on the study of effect of different particle size of graphite starting material towards the thermal stability and rheological properties of nanographite and micrographite thick film paste, and electrical conductivity of graphite thick film. Graphite starting material with the average particle size of <20 µm was used as source of micron size particles while the same material was milled for 6 h to generate nanosized particles in the range from 13.3 mm to 116.5 nm. Organic binder solution comprising linseed oil, m-xylene and α-terpineol was mixed with the nano and micron-sized particles of graphite powder respectively at 40°C for 24 h. Thermal analysis results showed that thick film paste obtained from nanosized graphite starting material (A) decomposed at lower temperature than the paste prepared from micron-sized graphite starting material (B). Both graphite paste samples with different particle size were printed onto alumina substrates using tape casting method followed by subsequent heating at 300°C and 350°C. Viscosity measurements revealed that the viscosity of paste obtained from nanosized graphite was significantly higher than the paste

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Keywords: nanographite thick film; linseed oil; conductive thick film; polymer thick film; particle size.

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