THICK PRINT COPPER PASTES FOR ALUMINUM NITRIDE SUBSTRATES

Technical Field

[0001] The present application relates to thick print copper electroconductive paste compositions suitable for use with an aluminum nitride substrate. The copper electroconductive paste compositions described herein are plateable and suitable for wirebonding. They have excellent adhesion to the underlying aluminum nitride substrate. While not limited to such applications, the copper electroconductive paste compositions described herein may be used in high temperature, high voltage and/or high amperage electronics applications (e.g., in electric vehicles).

Background

[0002] In recent years, it has been desirable to employ aluminum nitride (AlN) substrates for circuit boards used under highï temperature environments, particularly for high power applications. AlN substrates have been promising candidates due to their excellent properties, including high thermal conductivity (130ï 200 $Wm^{ï 1}K^{ï 1}$) and low coefficient of thermal expansion (CTE) (4ï 4.5 $ppmK^{ï 1}$). The combination of high thermal conductivity and low CTE gives aluminum nitride good thermal shock resistance. Furthermore, aluminum nitride has a flexural strength exceeding that of alumina and beryllia, exhibits a low hardness which enables it to be machined easily, and is stable at temperatures in excess of 900º C in an oxidizing environment and up to 1600 º C in a reducing environment.

[0003] Despite the promise of aluminum nitride, application of thickï films on aluminum nitride or aluminum nitrideï containing substrates is severely limited by the lack of compatible thickï film paste compositions which adhere sufficiently to such materials. In order to adhere metal conductors to aluminum nitride substrates, the use of thick film