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Enhanced mechanical stability of high temperature ultra-thin glass/polymer composite dielectrics

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Abstract:

Ultra-thin alkali free glass with high breakdown strength was coated with submicron polyurethane coating. The polymer coating heals surface and edge defects and improves the bending properties such that the minimum bending radius was ~ 1 cm. The dielectric permittivity and loss of the polymer coated glass was ~ 6.4 and <0.01 respectively upto 125 °C and was similar to the uncoated glass. The process allows to mitigate the effect of edge defects caused due to the cutting or handling of glass and is key to the development of high temperature wound glass capacitors.

Key words: Ultra-thin glass, Mechanical stability, Polymers, Thin Films, Dielectrics, Glass Capacitors

1. Introduction:

Alkali-free glass is a promising dielectric for the design of high energy density capacitors for automotive and power electronic applications owing to high breakdown strength (11-14 MV/cm), excellent temperature stability (~ 180 °C), high dielectric constant (~ 6), low loss (0.25%) with volumetric energy density as high as 38 J/cm³ [1-4]. However, polymer film capacitors are far more attractive for commercial applications despite having lower energy density (1 – 2 J/cc) due to their low cost, excellent mechanical properties and

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