

Mechanical Engineering Master's Defense

Process Optimization of Silver Iodide-Silver Metaphosphate Ionic Glass Molding for Solid State Superionic Stamping

School for Engineering of Matter, Transport and Energy

Gautam Panikkar

Advisor: Dr. Keng Hsu

abstract

In this research work, the process optimization of silver iodide-silver meta phosphate ionic glass molding for solid state super ionic stamping was performed. Solid state super ionic stamping is a process of all solid ambient condition electrochemical nano patterning technique. In solid state super ionic stamping, anodic dissolution on a solid electrolyte – metal interface and subsequent charge-mass transport in the solid electrolyte is used for obtaining nanometer features on the metallic surface. The solid electrolyte referred to as the stamp is pre-patterned with features to be obtained on the metallic surface. This research developed the process for obtaining solid state super ionic stamp with specific dimensions by making use of compression molding. The compression molding process was optimized by varying the process parameters-temperature, pressure, holding time, pressing time and cooling time. The objective of the process optimization was to obtain best geometrical features for the stamp including flatness and surface roughness and by optimizing the compression molding process, stamp with minimum flatness and surface roughness was obtained. After the experimental optimization of the process was completed, statistical analysis was performed to understand the relative significance of the process parameters and the interaction of the process parameters on the flatness and surface roughness values of the molded stamp. Structural characterization was performed to obtain the variation of average domain size of ionic glass particles within the molded glass disk by varying the process parameters of holding time, pressing time and cooling time.



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