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Limitation of Rheology and Curing Processes for Tiny Adhesive Dot with Various Dispensing Systems in Hard Disk Assembly Process

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In order to reduce the size of magnetic head in hard disk manufacturing, an important assemble process required to further develop is an adhesive dispensing at controllable small amount in order of nanoliter. Together with the confined tiny space during assembly, the exposure of UV light for rapid adhesive curing may not be possible thus the shadow curing with shorten period is also needed to be developed. For manufacturing process, a method to determine the percentage of cure of this tiny adhesive dot is also necessary to verify the optimum assemble process. In this work, the rheology of adhesive was studied for two dispensing systems including time-pressure and microdot valve dispensing systems. The system parameters including air pressure, dispensing time and spring force were varied to determine the limitation of parameters relative to fluctuation of dot size variation. The material parameters of adhesive especially viscosity were also modified in order to describe the type of fluid flow behavior. After forming the desired dot size, the curing process was investigated by heat cure, UV cure and dual cure. The gel fraction and differential scanning calorimeter (DSC) were used to determine the curing percentage. The amount of heat required to complete phase transition indicated in DSC cure is the reliable parameter to determine the degree of cure. Fourier transform infrared absorption is hard to apply to detect the curing process while the Raman spectroscopy has advantage potential to determine the degree of curing. The micro-Raman spectrometer can demonstrate the micro-region of different degree of cure on nanoliter adhesive dot size by the ratio of observed peak heights.

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