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Development of apolymeric nanoactuator with its applications

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Recently, there are huge demands for nanoscale actuation and positioning with the rapid progress of nanotechnology. Nanoactuationbased on piezoelectricity is one of the most popular methods for nanoactuation. Flexure mechanism have been introduced as one of the most effective methods to guide nanometer-scale motion to the desired motion mode. As a result, various types of nanoactuators using both piezoelectric actuator and flexure mechanismareapplied to a great variety of applications. However, typical materials for flexure mechanism is metal and it is machined using wire-cut electrical discharge machining to ensure manufacturing accuracy. Therefore, careful consideration needs to be made to avoid corrosion and circumference interference. Here, we presented a chip-like polymeric nanoactuatorbased on a flexure mechanism and piezoelectric actuation. Motion specification and injection moldability were expected using FEM softwaresin its design stage to achieve higher motion accuracy and avoid parasitic motion. The material for the actuator was a cyclic olefin copolymer (COC), which provided superior mechanical and optical properties and biocompatibility than other polymers.The nanoactuator was fabricated using mesoscale injection molding, then it was equipped with piezoelectric stack actuation, capacitive displacement sensor and a PID controller for experimental verification. From the experiments it could be demonstrated that the nanoactuator had a travel range of 15 microns and control error was less than 3 nm. The developed nanoactuator is being applied to optical alignment and micro-bioreactor for cell biology.

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Biography

Y. H. Jeong has completed his PhD at the age of 30 years from POSTECH and postdoctoral studies from Yonsei University and University of Illinois at Urbana-Champaign. He is an Assistant Professor at Department of Mechanical Engineering, Korea Polytechnic University, Gyeonggi, Korea. He is currently a co-PI of Immune-network Pioneer Research Center sponsored by the National Research Foundation of Korea. He has published more than 30 papers in reputed journals.

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