

Prototype tactile sensor for catheters made from vinylidene fluoride oligomer

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Abstract. Organic ferroelectrics, such as poly(vinylidene fluoride) [PVDF], which are commercially available as hydrophones, and its trifluoroethylene copolymer P(VDF/TrFE) are promising materials that may be used as tactile sensors due to characteristics such as: 1) high piezoelectric voltage sensitivity; 2) flexibility, thinness and low weight; 3) responsiveness over a wide frequency range; and 4) durability and inertness to chemical agents. Vinylidene fluoride (VDF) oligomer is a new substance with a smaller number of VDF units and lower molecular weight than PVDF. We previously reported that the piezoelectric coefficient of VDF oligomer was greater than that of P(VDF/TrFE), and that a film composed of VDF oligomer was thin and uniform. In this study, based on these experimental results, we produced a prototype tactile sensor for catheters using VDF oligomer and tested its fundamental performance. The stress rate applied on the sensor tip could be determined using the sensor output. We then performed actual insertion of the sensor, using a carotid artery model for bifurcation stenosis. The findings obtained confirm the feasibility of this sensor for improving catheter manipulation and palpation of tissue.