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Immunomagnetic separation in microchannels – from MEMS to bioNEMS. ASHOK SINHA, ISHWAR PURI, Virginia Polytechnic Institute and State University, RANJAN GANGULY, Jadavpur University, ENGINEERING SCIENCE AND MECHANICS TEAM — Operation of a "proof of concept" microfluidic sensor for detecting water-borne pathogenic agents is tested. The sensor is based on a scaled down version of '*immunomagnetic separation*'. The fundamental operation of the sensor consists of two miniaturized processes – mixing of the microspheres with the sample fluid and their separation from the background fluid. The microspheres are allowed to mix with the sample fluid such that the pathogens interact with the coated microspheres. Subsequently, the pathogen-microsphere conjugates are 'separated' from the background water sample by strategically placed micron sized electromagnetic traps on the channel walls. The conjugates may be transported to other sections of the sensor for detection and analysis. Sensitivity of the MEMS based sensor will depend on the extent of the initial mixing in the mixer and subsequent particle separation in the separator. While mixing in microchannels has drawn much research attention over the years, magnetic separations at this scale is not well characterized. A viable microfluidic network is conceptualized based on flow requirements for efficient magnetic particle entrapment. The use of magnetic microspheres was observed to enhance cross stream mixing in the otherwise laminar microchannel flow

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