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Immunomagnetic Nano-Screening Chip for Circulating Tumor Cells Detection in Blood A.P. HORTON, N. LANE, J. TAM, K. SOKOLOV, H.R. GARNER, J.W. UHR, X.J. ZHANG — We present a novel method towards diagnose cancer at an early stage via a blood test. Early diagnosis is high on the future agenda of oncologists because of significant evidence that it will result in a higher cure rate. Capture of circulating tumor cells (CTCs) which are known to escape from carcinomas at an early stage offers such an opportunity. We design, fabricate and optimize the nanomagnetic-screening chip that captures the CTCs in microfluid, and further integrate the nano-chip with the new multispectral imaging system so that it can quantify different tumor markers and automate the entire instrument. Specifically, hybrid plasmonic (Fe_2O_3-core Au shell) nanoparticles, conjugated a collection of antibodies especially chosen to target breast cancer CTCs, with high magnetic susceptibility will be used for effective immunomagnetic CTC isolation. Greatly increased sensitivity over previous attempts is demonstrated by decreasing the length scale for interactions between the magnetic-nanoparticle-tagged CTCs and the isolative magnetic field, while increasing the effective cross-sectional area over which this interaction takes place. The screening chip is integrated with a novel hyperspectral microscopic imaging (HMI) platform capable of recording the entire emission spectra in a single pass evaluation. The combined system will precisely quantify up to 10 tumor markers on CTCs.

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