

Distance magnetic nanoparticle detection using a magnetoelectric sensor for clinical interventions

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Abstract: Distance magnetic nanoparticle detections were investigated by using a magnetoelectric based magnetic sensor with a long type bilayer Metglas/PZT laminate composite. In homogeneous magnetic fields, the sensor exhibits a sensitivity of 307.4 mV/Oe, which is possible for a detection limit of 2.7×10^{-7} emu. This sensor can detect an amount of 0.31 μg of the superparamagnetic Fe_3O_4 -chitosan fluid at 2 mm height above the sensor surface. To detect a spot with magnetic nanoparticles at a distance of about 7.6 mm, it should contain at least 50 μg of iron oxide. This approach is able to develop for local detection of magnetic nanoparticles at a depth of centimeters in the body during clinical interventions.

Keywords: Magnetic sensor; Magnetoelectric effects; Nanoparticle detection; Shear-lag effects; Medical application.

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