Integrated spintronic platforms for biomolecular recognition detection

Martins V.C., Cardoso F.A., Loureiro J., Mercier M., Germano J., Cardoso S., Ferreira R., Fonseca L.P., Sousa L., Piedade M.S., Freitas P.P.

INESC-Microsystems and Nanotechnologies, Rua Alves Redol 9, 1000-029 Lisbon, Portugal; Center for Biological and Chemical Engineering, Instituto Superior Técnico, Av. Rovisco Pais, 1049-001 Lisboa, Portugal; Instituto Superior Técnico, Avenida Rovisco Pais, 1000-029 Lisbon, Portugal; INESC-Investigação e Desenvolvimento, Rua Alves Redol 9, 1000-029 Lisbon, Portugal

Abstract: This paper covers recent developments in magnetoresistive based biochip platforms fabricated at INESC-MN, and their application to the detection and quantification of pathogenic waterborn microorganisms in water samples for human consumption. Such platforms are intended to give response to the increasing concern related to microbial contaminated water sources. The presented results concern the development of biological active DNA chips and protein chips and the demonstration of the detection capability of the present platforms. Two platforms are described, one including spintronic sensors only (spin-valve based or magnetic tunnel junction based), and the other, a fully scalable platform where each probe site consists of a MTJ in series with a thin film diode (TFD). Two microfluidic systems are described, for cell separation and concentration, and finally, the read out and control integrated electronics are described, allowing the realization of bioassays with a portable point of care unit. The present platforms already allow the detection of complementary biomolecular target recognition with 1 pM concentration.

Author Keywords: Biochips; Biomolecular recognition; Biosensors; Magnetic labels; Magnetoresistive sensors; Surface biochemistry

Year: 2008
Source title: AIP Conference Proceedings
Volume: 1025
Page : 150-175
Cited by: 1
Link: Scorpus Link
Document Type: Conference Paper
Source: Scopus

Authors with affiliations:

1. Martins, V.C., INESC-Microsystems and Nanotechnologies, Rua Alves Redol 9, 1000-029 Lisbon, Portugal, Center for Biological and Chemical Engineering, Instituto Superior Técnico, Av. Rovisco Pais, 1049-001 Lisboa, Portugal
2. Cardoso, F.A., INESC-Microsystems and Nanotechnologies, Rua Alves Redol 9, 1000-029 Lisbon, Portugal, Instituto Superior Técnico, Avenida Rovisco Pais, 1000-029 Lisbon, Portugal
3. Loureiro, J., INESC-Microsystems and Nanotechnologies, Rua Alves Redol 9, 1000-029 Lisbon, Portugal, Instituto Superior

Técnico, Avenida Rovisco Pais, 1000-029 Lisbon, Portugal

4. Mercier, M., INESC-Microsystems and Nanotechnologies, Rua Alves Redol 9, 1000-029 Lisbon, Portugal, Instituto Superior Técnico, Avenida Rovisco Pais, 1000-029 Lisbon, Portugal
5. Germano, J., Instituto Superior Técnico, Avenida Rovisco Pais, 1000-029 Lisbon, Portugal, INESC-Investigação e Desenvolvimento, Rua Alves Redol 9, 1000-029 Lisbon, Portugal
6. Cardoso, S., INESC-Microsystems and Nanotechnologies, Rua Alves Redol 9, 1000-029 Lisbon, Portugal, Instituto Superior Técnico, Avenida Rovisco Pais, 1000-029 Lisbon, Portugal
7. Ferreira, R., INESC-Microsystems and Nanotechnologies, Rua Alves Redol 9, 1000-029 Lisbon, Portugal, Instituto Superior Técnico, Avenida Rovisco Pais, 1000-029 Lisbon, Portugal
8. Fonseca, L.P., Center for Biological and Chemical Engineering, Instituto Superior Técnico, Av. Rovisco Pais, 1049-001 Lisboa, Portugal
9. Sousa, L., Instituto Superior Técnico, Avenida Rovisco Pais, 1000-029 Lisbon, Portugal, INESC-Investigação e Desenvolvimento, Rua Alves Redol 9, 1000-029 Lisbon, Portugal
10. Piedade, M.S., Instituto Superior Técnico, Avenida Rovisco Pais, 1000-029 Lisbon, Portugal, INESC-Investigação e Desenvolvimento, Rua Alves Redol 9, 1000-029 Lisbon, Portugal
11. Freitas, P.P., INESC-Microsystems and Nanotechnologies, Rua Alves Redol 9, 1000-029 Lisbon, Portugal, Instituto Superior Técnico, Avenida Rovisco Pais, 1000-029 Lisbon, Portugal