Magnetic Particles for Fully Automated Nucleic Acids Isolation and Their Application in Nanomedicine

Jaromir Hubalek[1], Jana Drbohlavova[1], Dalibor Huska[2], Vojtech Adam[2], Ales Horna[3], Libuse Trnkova[4], Rene Kizek[2]

[1]Department of Microelectronics, Faculty of Electrical Engineering and Communication, Brno University of Technology, Udolni 53, CZ-602 00 Brno, Czech Republic

[2]Department of Chemistry and Biochemistry, Faculty of Agronomy, Mendel University of Agriculture and Forestry, Zemedelska 1, CZ-613 00 Brno, Czech Republic

[3]Radanal Ltd., Okruzni 613, CZ-530 03, Pardubice, Czech Republic

[4]Department of Chemistry, Faculty of Science, Masaryk University, Kamenice 5, CZ-625 00 Brno, Czech Republic

hubalek@feec.vutbr.cz

Electrochemical DNA recognition has already known and described [1-3].Technologies based on ferro- and paramagnetic particles seem to be very perspective in isolation of RNA or DNA sequence for studying DNA-protein or DNA-medicament interaction in medicine [4,5]. The technique employs a modification of the magnetic micro- and nanoparticles surface by biomolecules. The most frequent techniques for nucleic acids capture are shown in Fig. 1. In the work the modification of magnetic particles surface coated by streptavidin is presented. This protein exhibit a high affinity to low-molecular compound as biotin. These particles can be used for recognizing a specific DNA or RNA sequences and its consequent identification.

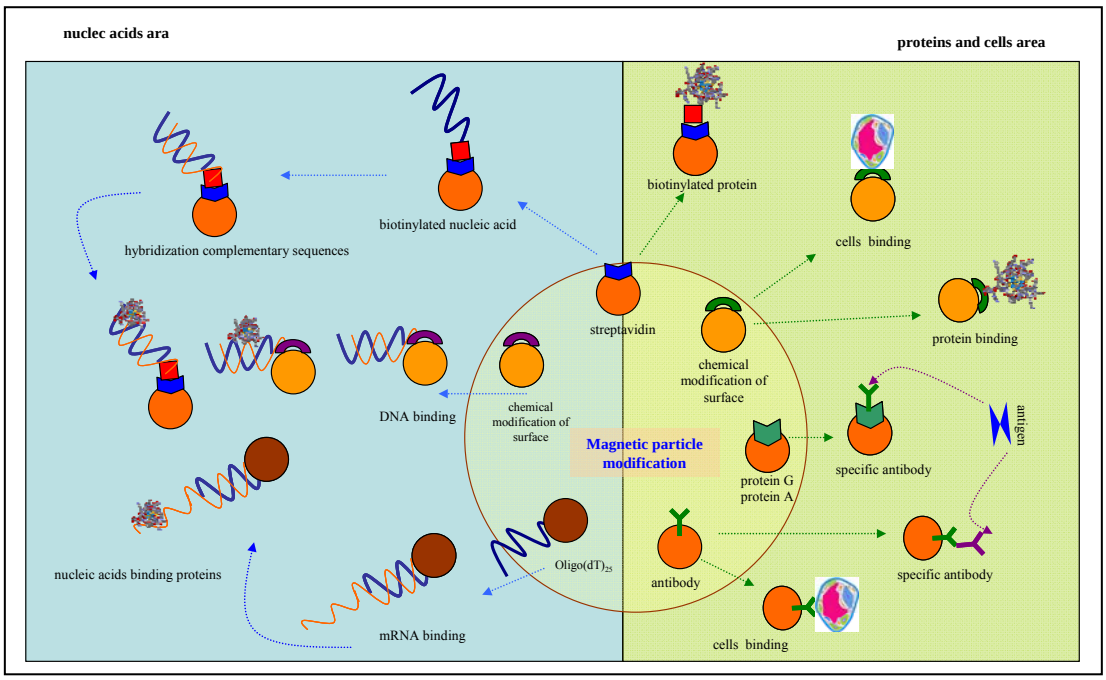

Figure 1. Possibilities in magnetic particles surface modification for capture of various biological molecules.

In our experiments superparamagnetic particles Fe_2O_3 were fabricated (Fig. 2). Paramagnetic properties are needed because magnetization disappears when magnetic field break off. Therefore the particles can be reused again after RNA capture. According X-ray diffraction measurement, the prepared sample consisted of 60% maghemite (γ-Fe_2O_3) and 30% of sylvite (KCl). Modified particles were added to the mRNA sample and hybridized [6-9] for 30 min at 25°C. After the removal of unspecific bound molecules the captured nucleic acid was released by temperature denaturation [6-9] lasting for 8 min at 85°C. The solution is then transferred

into a pure microplate and electrochemically analyzed. The electrochemical analysis was performed in the presence of acetate buffer at carbon printed electrodes containing carbon nanoparticles.

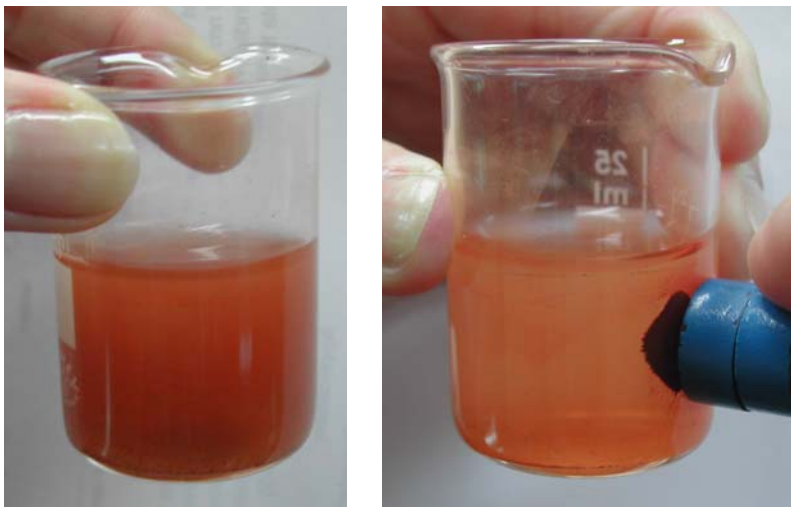

Figure 2. Illustration of magnetic properties of Fe_2O_3 nanoparticles.

The relative standard deviation of the proposed procedure based on the paramagnetic particles is 11 %. The efficiency of the nucleic acid capture during the hybridization process varied from 40 to 60 %.

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