Microfluidics for investigation of nanoparticle properties

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Nanotechnology development in the recent years has showed numerous interesting examples of nanoparticle uses. Most biological applications require their presence in a liquid phase, mainly water. Working with particles of nanometer scale requires a precise manipulation of the liquid phase. This can be achieved within the framework of microfluidics. In this work we show how our research interests in magnetic and plasmonic nanoparticles can benefit from transferring the corresponding experiments to microfluidic systems.

Three systems with an increasing production complexity and degree of accuracy are considered to improve the crucial interface formation in the experiments of magnetic particle diffusion and micro-convection and the surrounding solution control in close-packed plasmonic nanoparticle systems. For example, the use of the simplest system [1] in diffusion experiments of magnetic nanoparticles (Fig.1 (a)) already allows us to obtain accurate results (Fig.1 (b)-(c)) in much shorter time. We indicate the obtained improvements in terms of our results and discuss the fabrication methods by considering the cost of implementation, production time and achievable quality.

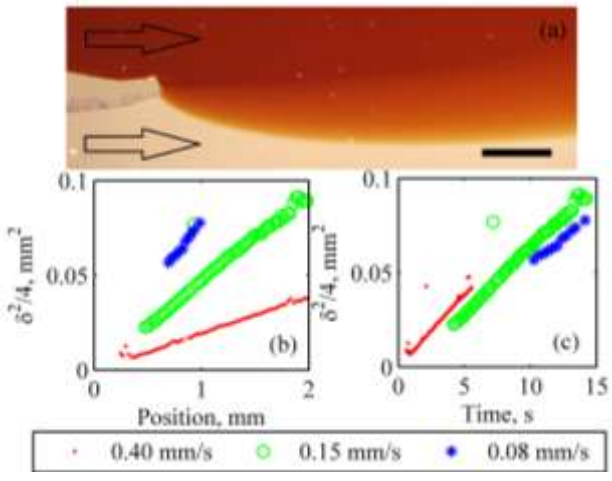

Fig.1 (a) Diffusion of magnetic nanoparticles observed in microfluidics cell. Arrows mark flow direction, scale bar is 1 mm. Squared diffusion length dependence on horizontal position agrees with Fick's law (b) and after normalization by flow speed (0.08-0.40 mm/s) shows same slope (c) which denotes the diffusion coefficient.

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References

1. G. Kitenbergs, K. Ērglis, R. Perzynski, A. Cēbers, JMMM **380**, 227 (2015)