

Red Blood Cell Ghosts for biomedical applications: Blood on a Chip

Sebastian Himbert ^{a,b}, Richard Alsop^a, Christian Wagner^b, Maikel Rheinstädter^a

^a *Department of Physics and Astronomy, McMaster University, Hamilton, ON, Canada*

^b *Department of Experimental Physics, Saarland University, Saarbrücken, Germany*

The preparation of Red Blood Cell (RBC) Ghosts is a well-known protocol in biological and medical research [1]. It describes the extraction of the membrane from RBCs. Another well-known protocol is the preparation of highly ordered stacks of artificial lipid bilayers on silicon wafers [2]. Such experiments in particular allow the study of the interaction between cell membranes and drugs, small molecules, and bacteria.

There are various attempts to adapt this protocol to a native cell membrane [3,4]. For the first time we were able to combine both described protocols and to prepare highly ordered stacks of RBC membranes on silicon wafers. These systems can now be used as inexpensive and safe platforms for testing the effect of drugs and bacteria on RBC membranes in-vitro using biophysical techniques, such as X-ray and neutron diffraction, optical spectroscopy and AFM.

We present the preparation and characterization of “Blood on a Chip” from molecular structure to the morphology of the membrane assemblies. Figure 1 shows the electron density and a reflectivity curve of a RBC membrane. Aspirin, which is commonly used in the “low-dose-aspirin therapy” was found to have a drastic effect on human blood membranes and to lead to a significant softening and fluidification of the membranes.

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