EXPERIMENTAL REPORT

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TITLE Boron entrapping and iron deposition inside magnetic liposomes – time-resolved Neutron scattering TR-SANS

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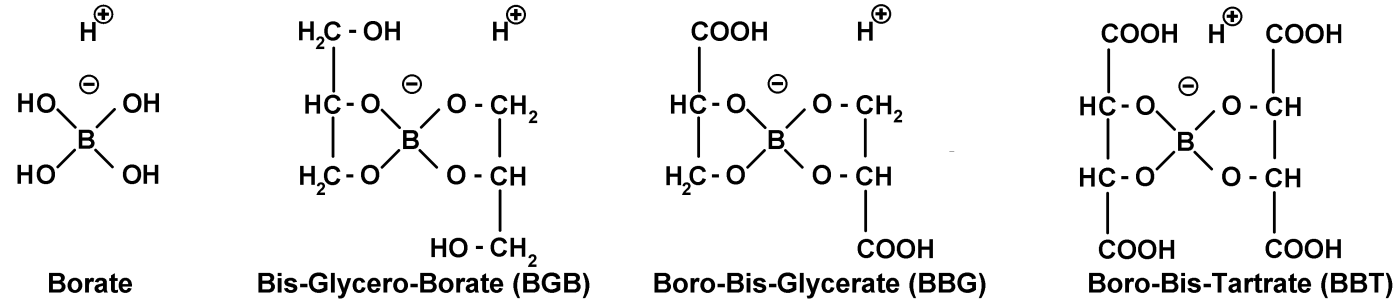
Liposomes are hollow nanoparticles from biogenic lipids, which are established for DNA, protein, dye or drug transport in research and clinical applications. These can be improved, if the liposomes can be magnetically manipulated (pulled), which requires magnetic liposomes. While several groups work with metal bearing lipids or entrapped metal-chelates (1), we established the novel magnetic shell liposomes ((2), see ILL-report 8-03-413). A fascinating opportunity of magnetic liposomes is the capability of entrapping drugs or Boron, which offers a local magnetic drug or radiation cancer therapy by Neutron capture (^{10}B (n, α) ^{7}Li). This application depends on a high threshold level of neutron flux and Boron concentration.

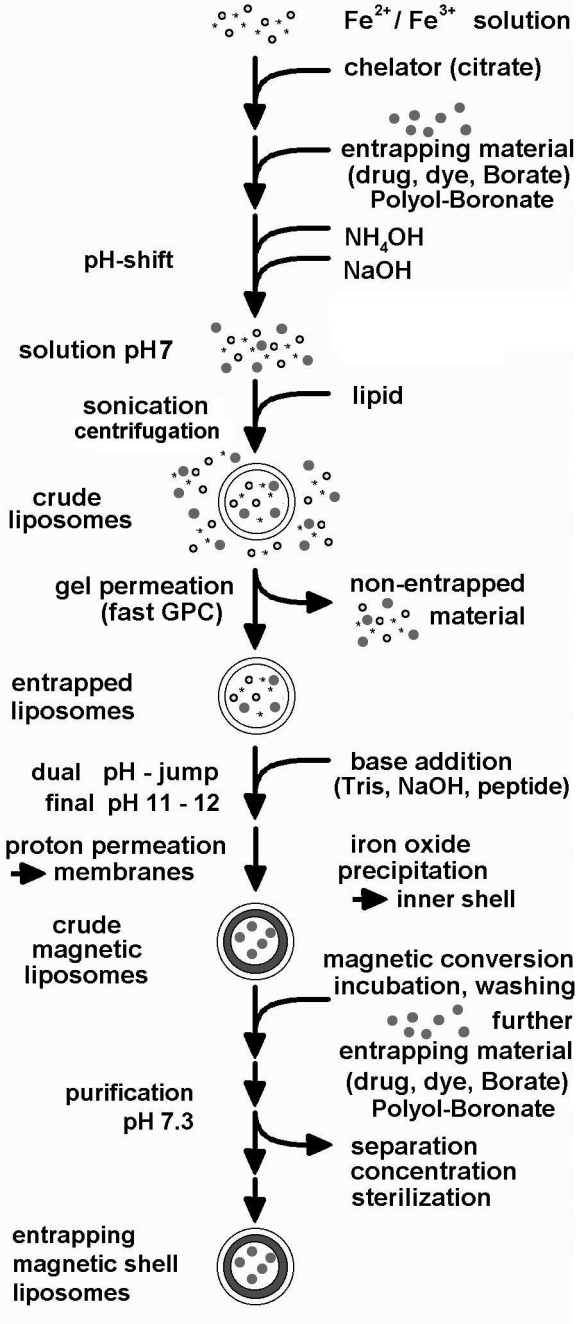
Results: We extended the reported magnetic liposomes (2) by entrapping (fig.2) of the four water-soluble Boron compounds depicted in Fig.1. Especially the synthesized compounds BGB and BBG (0.25 M) were entrapped in an amount of 10^7-10^9 /liposome (depending on size), which are thus "Giga-Boron particles". The structure of Boron-iron entrapped liposomes during iron oxide deposition was estimated by time resolved neutron scattering (fig.3) and electron microscopy. As shown in fig.4 & 2 the deposition conditions were improved by separating the pH-jump in two sub-jumps with ~1 h incubation at pH9 between, and a peptide-aminoacid target-buffer (Gly-Gly). This stabilizes the final pH, which was varied from pH10–12. The magnetic liposomes of Di-Oleyl-PhosphatidylCholine were successfully observed by TR-SANS and electron microscopy (TR-EM).

Fig.1: Boron-compounds



Figures: Fig.**2 :** Experiment N° 9-10-661 **Fig.3 :**

Flow chart of magnetic liposome preparation



Setup for time resolved neutron scattering

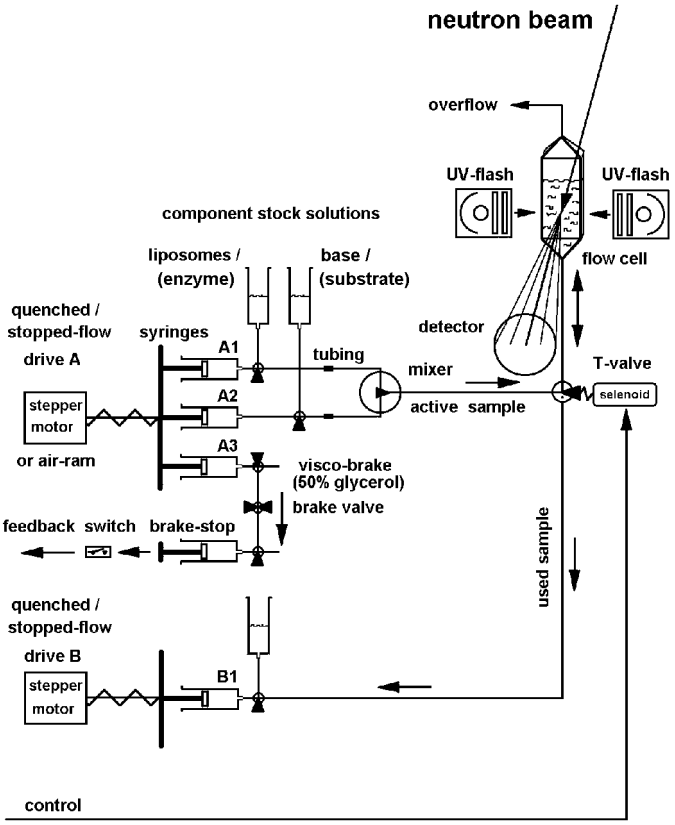
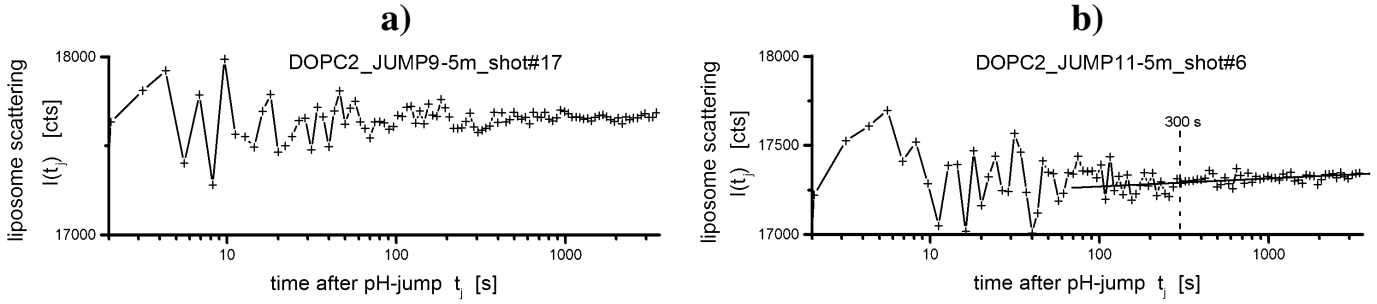


Fig.4: Time-resolved neutron scattering during stopped-flow synthesis of BGB-entrapped liposomes (10g/l DOPC, H_2O) a) during 1st pH-jump (7⇒9) and b) in 2nd pH-jump (9⇒11). The iron oxide deposition occurs during 300s at pH11.



References: 1) T. Nawroth, R. Gebhardt, K. Zwicker, G. Goerigk, DESY-HASYLAB Annual report 2000, part1, ; 2) T. Nawroth, M. Rusp, R.P. May a) European Conference Neutron Scattering (2003) proc., K3 & K40; b) GDCH conference Munich (2003) proceedings, c) Physica B (2004), in press