



Bead Stability

Stability of MagSi-S and MagSi-DNA beads in various conditions

Introduction and background

MagSi magnetic silica beads are composed of ferro fluid particles embedded in a matrix of silica. When the silica matrix is destroyed, the iron oxide leaks into the medium, resulting in a yellowish discolouring. To test the stability of our MagSi beads, the iron oxide leakage was measured under various conditions. The influence of pH, temperature and ionic strength was tested for Magsi-S and MagSi-DNA beads and compared to competitor beads.

Experiment

MagSi-S beads: 400 μ l of MagSi-S beads (10 mg/ml) were pipetted in a deep well micro plate. Beads were washed with water and resuspended in 400 μ l of buffers with varying pH (pH 1 – 13 using HCl or NaOH) and ionic strength (0, 1 and 4 mol/L of NaCl). This was incubated overnight and de A_{320} of the supernatant was measured to detect the iron oxide leakage.

MagSi-DNA beads: 50 μ l of MagSi-DNA and competitor DNA beads were pipetted in a micro plate. Beads were washed with water and resuspended in 200 μ l of buffer (pH 1 - 13, 0 or 4M NaCl). The plate was the incubated 5 hours either at room temperature or at 95 $^{\circ}$ C. As read out, the A_{320} of the supernatant was measured.

Results

The MagSi-S beads only show iron oxide leakage at pH 1 and 2. This means the silica matrix is stable from pH 3 till pH 13. The increased NaCl concentration has only little influence on the structure of the silica matrix.

MagSi-S stability test

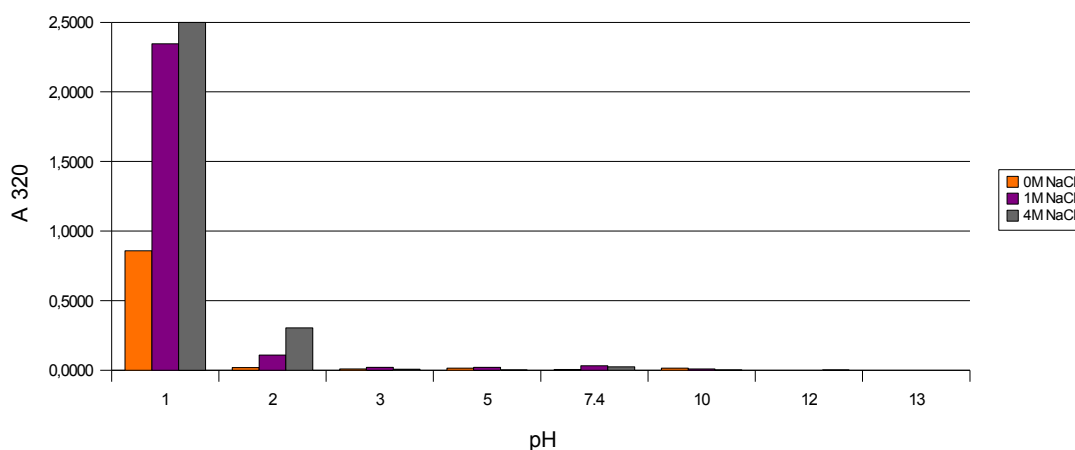


Figure 1: Iron oxide leakage of MagSi-S beads. Beads were incubated overnight in a buffer ranging from pH 1 to 13 and 1 to 4 Molar of NaCl.



The MagSi-DNA beads contain more iron oxide (ferro fluid) than the MagSi-S beads. Also the applications in which these beads are used involve high salt concentrations, varying pH (figure 2 and 3) and varying temperatures. Therefore, also the influence of high temperature (95°C) was measured (figure 4 and 5).

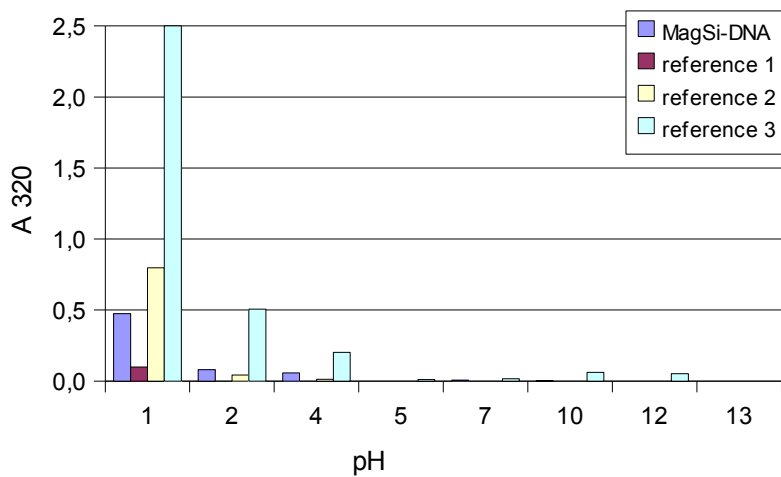


Figure 2: Iron oxide leakage of MagSi-DNA beads. Beads were incubated 5 hours at room temperature in a buffer ranging from pH 1 to 13, containing 0 M NaCl.

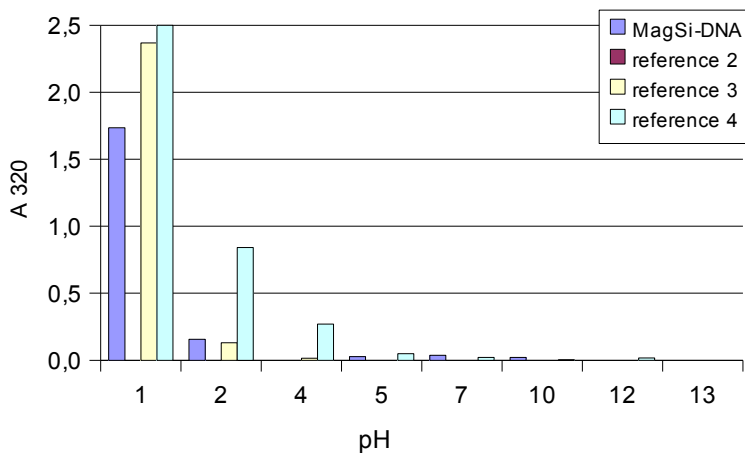


Figure 3: Iron oxide leakage of MagSi-DNA beads. Beads were incubated 5 hours at room temperature in a buffer ranging from pH 1 to 13, containing 4 M NaCl.

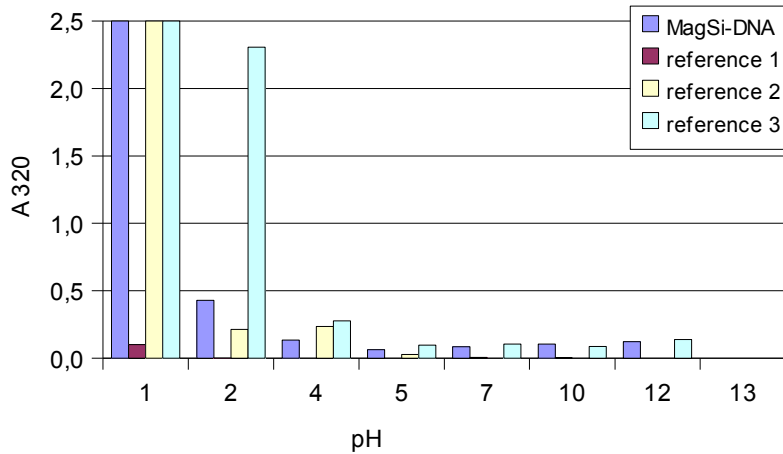


Figure 4: Iron oxide leakage of MagSi-DNA beads. Beads were incubated 5 hours at 95°C in a buffer ranging from pH 1 to 13, containing 0 M NaCl.

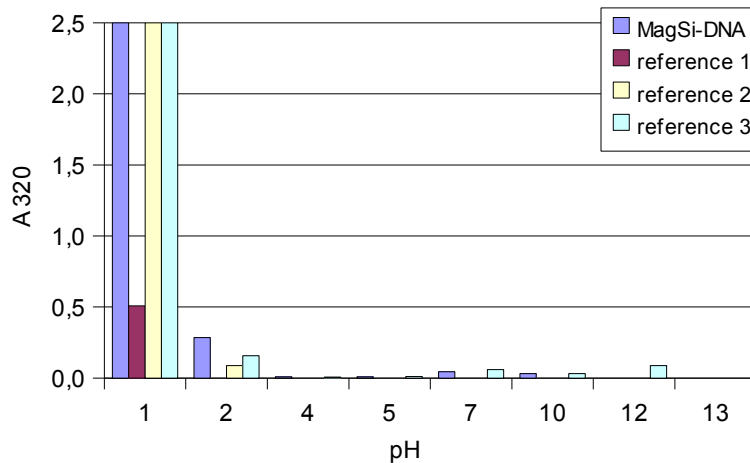


Figure 4: Iron oxide leakage of MagSi-DNA beads. Beads were incubated 5 hours at 95°C in a buffer ranging from pH 1 to 13, containing 4 M NaCl.

Conclusion

MagSi-S and MagSi-DNA beads are stable in a pH range from 3 – 13 without showing any iron oxide leaching. The MagSi-DNA beads also stay intact at a temperature of 95°C.