Plasmoid behavior in LHD plasmas

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It is well known that an ablation cloud; a high density and low temperature plasmoid, drifts to the lower field side in tokamak plasmas, which leads to a good performance on fueling in tokamak. Such a good performance, however, has not been obtained yet in the planar axis heliotron; Large Helical Device (LHD) experiments, even if a pellet has been injected from the high field side. The purpose of the study is to clarify the difference on the plasmoid motion between tokamak and LHD plasmas by using the MHD simulation including ablation processes [1]. It is found in tokamaks that the drift motion is induced by a tire tube force and 1/R force in the major radius direction, and that the pressure and density of the plasmoid have oscillation due to fast compressional Alfven wave [2]. On the other hand, the upper and lower portions surrounding the plasmoid center drift to the higher field side, because $1/R$ force by magnetic field becomes negative in the major radius direction since the magnetic field surrounding the plasmoid is accumulated by the extremely large ablation pressure and the magnetic pressure perturbation becomes positive. It is also found that the plasmoid dose not drift when the perturbation of the plasmoid is small. In addition, the motion of the plasmoid is investigated in straight helical plasmas in the cases that the plasmoids are located at lower and higher field sides than one at the magnetic axis. When the initial plasmoid is located at lower field side, it is found in that the plasmoid quickly expands along the magnetic field and simultaneously drifts to the outside, namely the lower field side. When the initial plasmoid is located at higher field side, it is found that the plasmoid drifts to the inside, namely the lower field side. However, the plasmoid subsequently drifts to the outside. In other words, it drifts to the higher field side. This fact might be one of the reasons why the motion of the plasmoid dose not depend on the location of the pellet injection so much in LHD experiments. Such a difference between tokamak and helical plasmoid will be clarified, and the motion of the plasmoid will be evaluated in LHD.

[1] R. Ishizaki et al., Phys. Plasmas **11** (2004) 4064.
[2] R. Ishizaki et al., IAEA-CN-149/TH/P3-6 (2006).