Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Effect of immersion in simulated body environment on mechanical properties of twist-oriented poly(lactic acid) screws. MASATO SAKAGUCHI, SATOSHI KOBAYASHI, Tokyo metropolitan university, COMPOSITE ENGINEERING LAB COLLABORATION — Poly(lactic acid) (PLA) has been applied to bone fixation devices, since it has high biocompatibility. In order to apply PLA device to a higher loaded part, mechanical properties of PLA have been improved by uniaxial drawing. However, mechanical properties along the other loading direction than the drawing direction such as torsion were not improved. Therefore, surgeon should be carefully conducted not to brake the reinforced PLA screw when tightening. In this study, screw is focused on as a bone fixation device. In order to improve torsional strength of a PLA screw, twist-orientation method was developed. PLA screw is prepared through a series of routes including casting, extrusion drawing, twist-orientation and forging. This screw was immersed in the phosphate buffered solution for 0, 8, 16 and 24 weeks, then shear strength, orientation function, crystallinity and molecular weight were measured. As a result, twist-orientation improves the initial torsional strength of PLA screw without the decrease in initial shear strength. In addition, the shear strength on twist-oriented screw is equivalent that of non-twist oriented screw during immersion until 24 weeks. This result shown that the twist-orientation does not decrease shear strength after immersion.

Masato Sakaguchi
Tokyo metropolitan university

Date submitted: 08 Dec 2015 Electronic form version 1.4