KTH SOLID MECHANICS SEMINAR; Friday, February 28th, 10.15; KTH Solid Mechanics Seminar room

Anna Ask,

"Electromechanic coupling in soft elastomers"

A solid body placed in an electromagnetic field will experience forces and torques of electromagnetic origin. In most cases this effect is negligible, at other times the effect is notably present but undesired, such as when large magnetic fields induce vibrations and possibly structural damage in power electronics. Dielectric elastomer actuators (DEA) on the other hand are applications which make use of the electromagnetic body forces to produce mechanical output (specifically motion, actuation) from electrical input. By placing a thin elastomer film between highly compliant electrodes and then applying a voltage difference, charges will aggregate on the electrode plates. As the charges are electrically opposite on the two electrodes, and cannot move through the insulating elastomer, the attractive forces between them will translate into a compressive force on the elastomer. Very large deformations have been demonstrated for DEA and they are considered very promising in technologies such as biomimetics and microrobotics.

In order to model and simulate the behavior of DEA, it is necessary to find appropriate constitutive relations for the behavior of the (visco-)elastic substrate (i.e. the elastomer) and for the electromechanical coupling. As the DEA are generally operated in the quasi-static regime, the electromagnetic problem reduces to electrostatics with corresponding governing equations. These can be solved in a straightforward manner using the finite element method, so that the solution to the electromechanically coupled problem can be found by simultaneously solving the mechanical and electric field equations.

Dr. Anna Ask: obtained her MSc in Engineering Mathematics from Lund University/LTH and started as a PhD student in solid mechanics at LTH in 2008. Her research topic was modeling and simulation of electroactive polymers (supervised by Prof. Andreas Menzel of LTH/TU Dortmund and co-supervised by Prof. Matti Ristinmaa of LTH). She got her licentiate in 2010 and defended her thesis and obtained her PhD in June 2013. Since July 1st 2013 se is employed at ABB Corporate Research in Västerås as an expert in continuum mechanics and material modeling. Dr. Anna Asks's research interests include constitutive modeling, numerical