



SUPPLEMENTARY MATERIAL to Analytical estimation of non-local deformation-mediated magneto-electric coupling in soft composites

Matthias Rambauser, Marc-André Keip*

*Institute of Applied Mechanics (CE), Chair of Material Theory
University of Stuttgart, Pfaffenwaldring 7, 70569 Stuttgart, Germany
<http://www.mechbau.uni-stuttgart.de/lsl>*

Abstract

The main article focuses on the magneto-electric sensitivity in terms of the electric field e . Below, we complement these results with selected plots for magneto-electric coupling in term of the induced polarization $\Delta p = p(h_{ext}) - p(h_{ext} = 0)$ and polarization sensitivity $\partial p / \partial h_{ext}$.

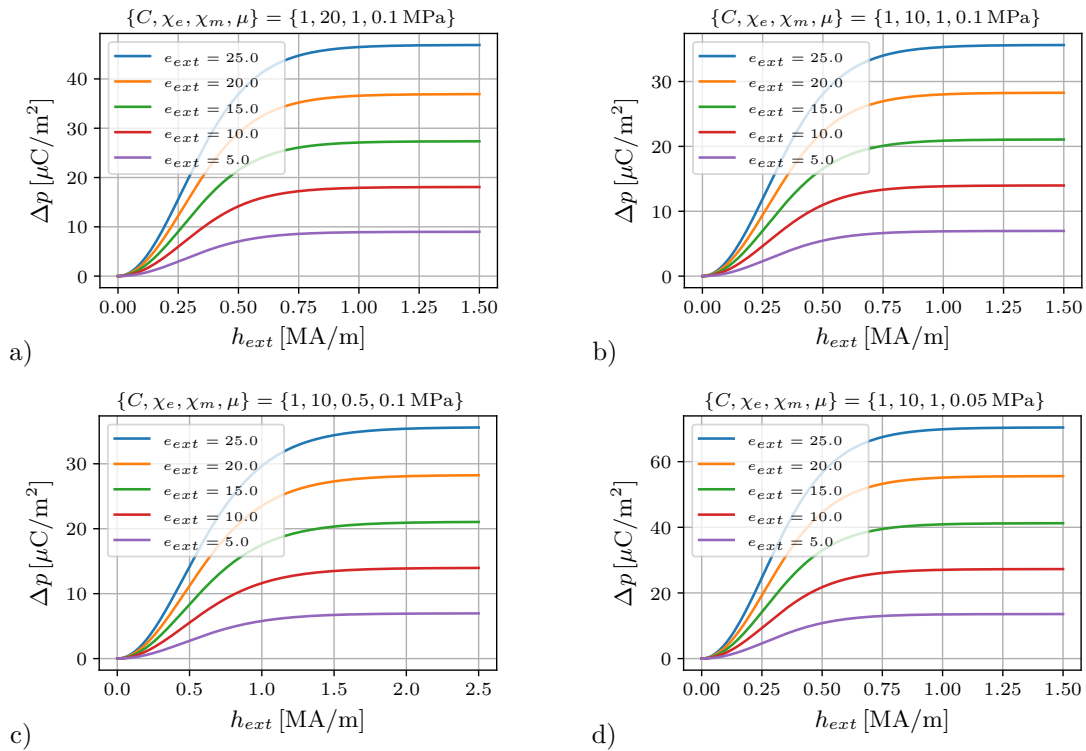


Figure 1: Induced electric polarization $\Delta p = p(h_{ext}) - p(h_{ext} = 0)$ for four different sets of material parameters. The plots of the induced polarization shown here correspond to Figure 11, where we show the induced electric field. In all plots the external electric field e_{ext} is given in MV/m .

*Corresponding author

Email address: keip@mechbau.uni-stuttgart.de (Marc-André Keip)

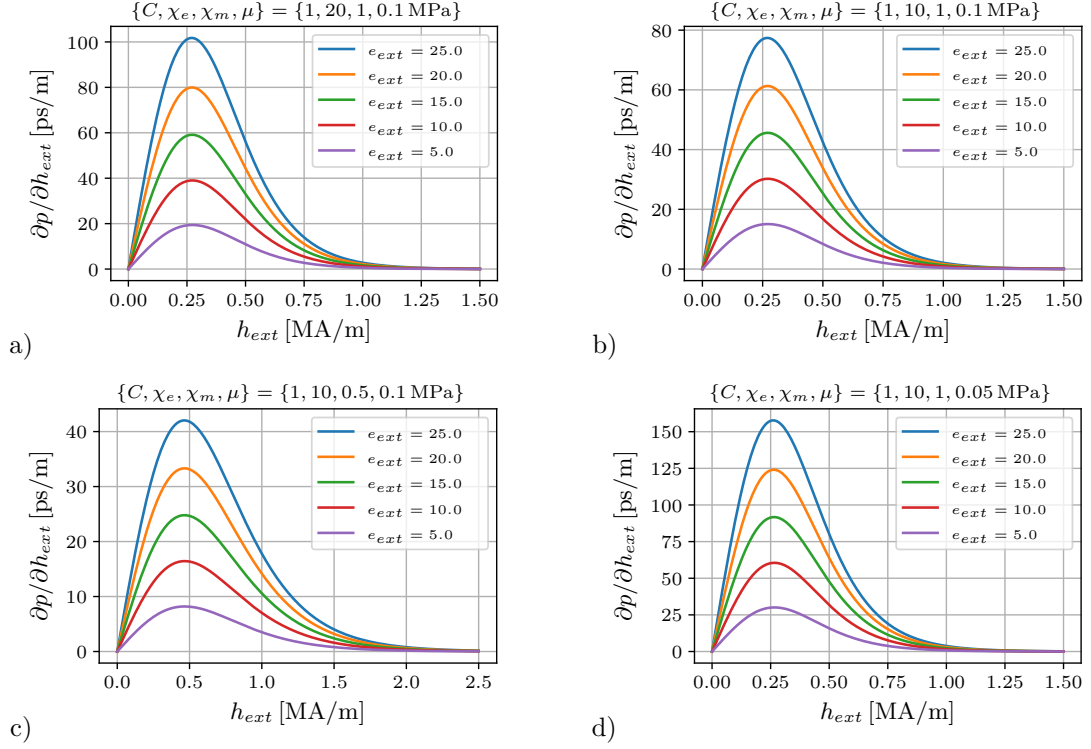


Figure 2: Non-local magneto-electric (polarization-)sensitivity $\partial p/\partial h_{ext}$ for four different sets of material parameters. The plots shown here correspond to Figure 12, where we show the sensitivities of the electric field. In all plots the external electric field e_{ext} is given in MV/m.

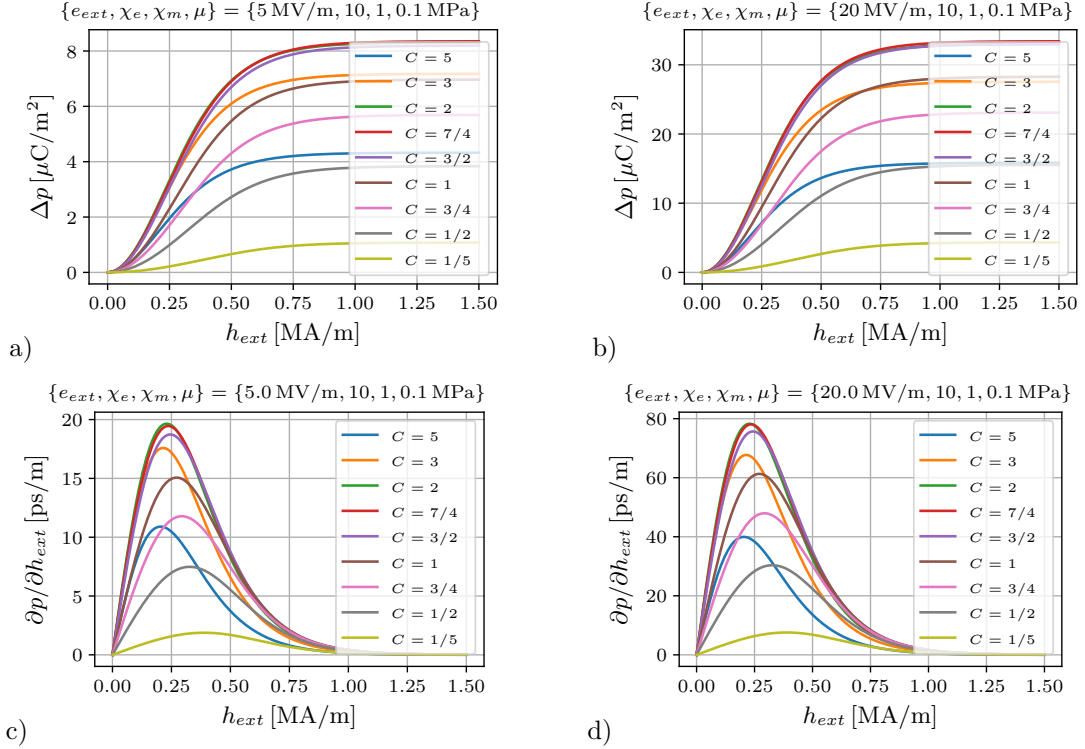


Figure 3: In the top row we show the induced electric polarization $\Delta p = p(h_{ext}) - p(h_{ext} = 0)$ for two different values of external electric field e_{ext} for a range of initial aspect ratios C . In the second row we depict the corresponding sensitivities $\partial p/\partial h_{ext}$. In all of these plots the magneto-electric coupling is strongest for C in the range of 3/2 to 3. See Figure 13 for the corresponding plot for Δe and $\partial e/\partial h_{ext}$, respectively.

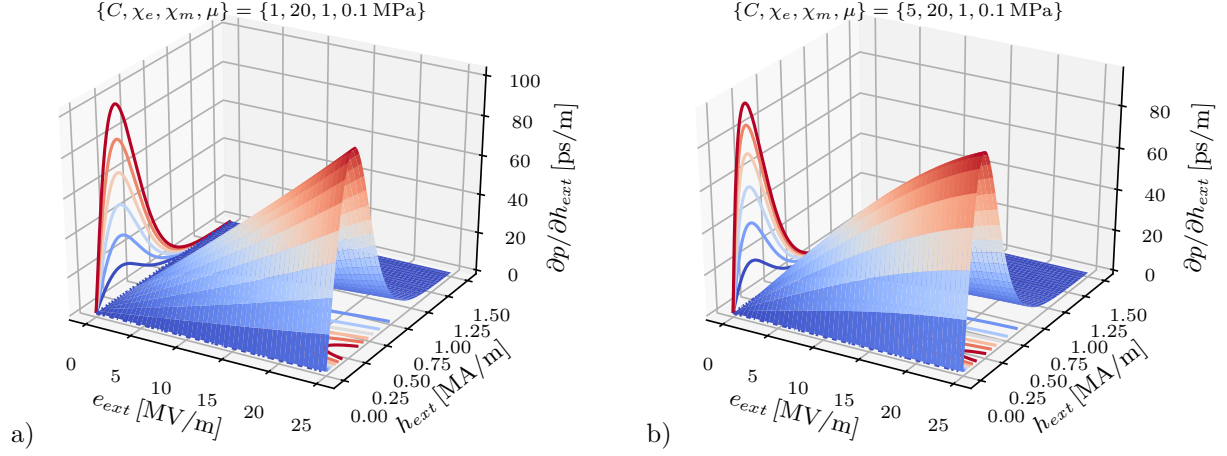


Figure 4: Surface plots of the magneto-electric sensitivity $\partial p / \partial h_{ext}$ as a function of the external fields e_{ext} and h_{ext} for initial aspect ratios $C = 1$ and $C = 5$ in a) and b), respectively. See Figure 14 for the sensitivity $\partial e / \partial h_{ext}$.

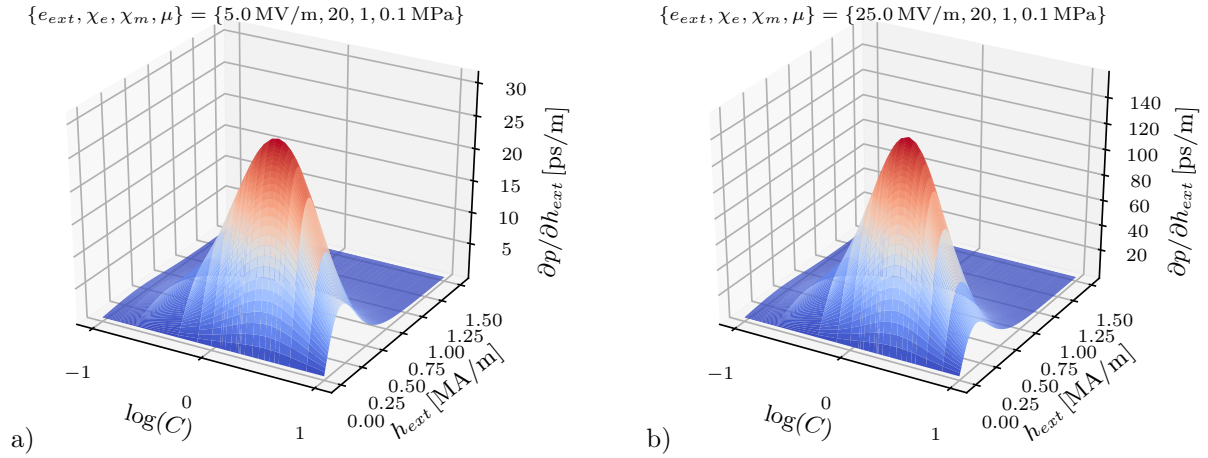


Figure 5: Surface plots of the magneto-electric sensitivity $\partial p / \partial h_{ext}$ as a function of the initial aspect ratio C and the external magnetic field h_{ext} . The external electric field was set to $e_{ext} = 5 \text{ MV/m}$ in a) and to $e_{ext} = 25 \text{ MV/m}$ in b). See Figure 15 for the sensitivity $\partial e / \partial h_{ext}$.