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Design an Iterative Learning Observer to Reconstruct the Interaction Force in AM-AFM

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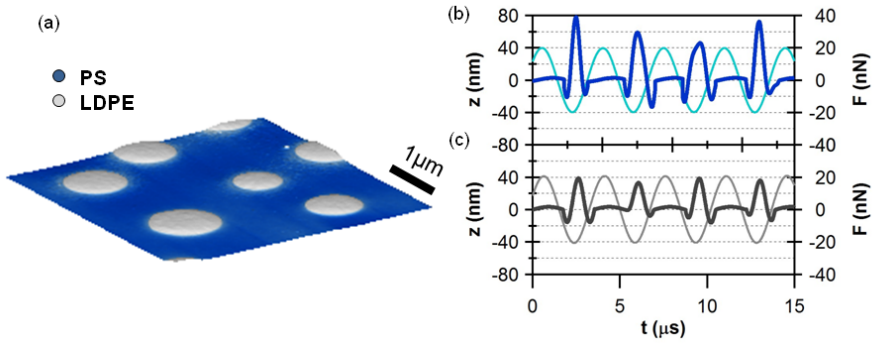
Extracting the time varying tip-sample interaction force in dynamic atomic force microscopy has been an important goal to improve the imaging capabilities of AFM with simultaneous measurements of material properties [1-4]. Here, we design an Iterative Learning Observer to reconstruct the interaction force from the wave profile of the cantilever. In this method, the interaction force is considered as an unknown time varying parameter and estimated by the designed observer.

Simulations and experiments prove the accuracy of this method in liquid and air for different materials. From the reconstructed force signals, we are able to obtain the average peak force, and consequently, using Hu and Raman equation [5], the Young modulus of the materials.



(a) Topography image of Polystyrene (PS) and Polyolefin Elastomer (LDPE) blend. **(b)** Signal and reconstructed force of PS (A_0=78nm) **(c)** Signal and reconstructed force of LDPE (A_0=78nm).

M. Stark, R,W.Stark, W.M. Heckl and R. Guckenberger, PNAS, **99**, 13, 8473-8478, (2002).
J. Legleiter, M. Park, B. Cusick and T. Kowalewski, PNAS, **103**, 13, 4813-4818, (2006).
S. Santos, K. Gadelrab, J. Font and M. Chiesa, New Journal of Physics, **15**, 083034, (2013).
A. Sikora and L. Bednarz, Meas. Sci. Technol., **22**, 094005 (2011).
S. Hu and A. Raman, Appl. Phys. Lett., **91**, 123106, (2007).

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STM And Nc-AFM Investigation Of Submonolayer Copper Oxide Structures

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