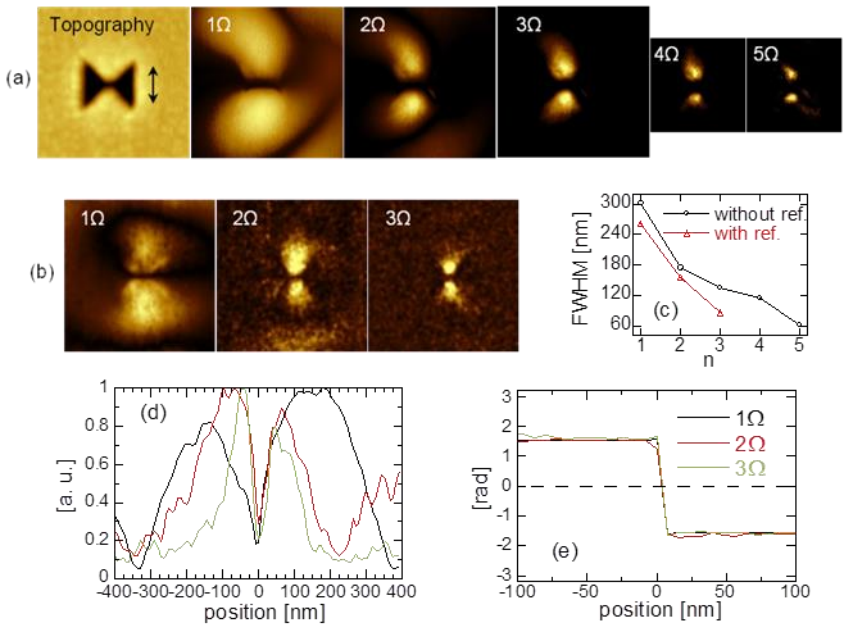

Fig. 9. AFM topography image and optical images of $|E_p|$ at different harmonic orders (a) without and (b) with the reference beam. The scan size is 0.8 × 0.8 μm^2 for the topography image and 1Ω to 3Ω, and 0.5 × 0.5 μm^2 for 4Ω and 5Ω. The black arrow in (a) indicates the incident polarization. (c) FWHM spot sizes as a function of the harmonic order, both with and without the reference beam. Line scans of the demodulated (d) amplitude and (e) phase in the presence of the reference beam.

5. Conclusion

In this work, numerical simulations are carried out to compute the interaction between an oscillating tip and the local near field produced by a nanostructure, and to compute high harmonic signals via a demodulation process. Dielectric tips such as a Si tip are found to be more appropriate for characterizing near fields. With a polarization-resolved collection of signals, it is possible to estimate the responses of the tip to different near field components, which helps to characterize the scattering of the tip. An important finding is that, with the increasing harmonic order, the simulated/measured spot size reduces, and is in closer agreement with the actual near field. Therefore, it is important to carry out s-NSOM measurements at higher order harmonics in order to obtain measurement results close to the actual near field.

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