been observed that deposition at low monomer partial pressure encourages high step coverage. Thus, the thickness of this second polymer layer can be controlled with a good degree of precision, by engineering the deposition conditions.

While Figure 3.3. shows a patterned surface where the thicknesses of the two layers were matched, it is possible to intentionally mismatch the thicknesses to create a topographical in addition to a chemical pattern. By depositing the first polymer layer at a thickness of 500 nm and the second at 200 nm, a topographic relief could be created, where the squares appeared as depressions. The depressions are readily apparent in both the oblique view as well as the cross-section in the inset of Figure 3.6.

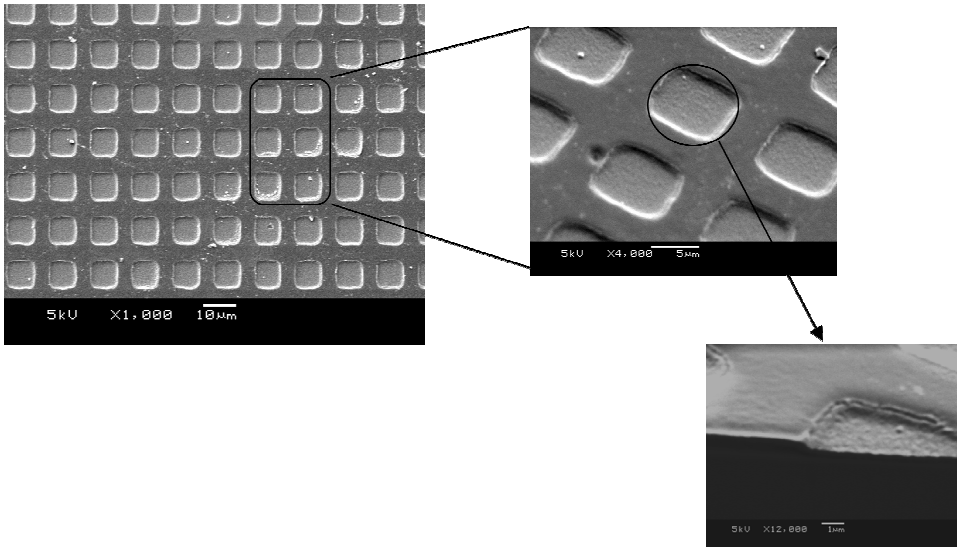

Figure 3.6. SEM Cross section showing topography of depressed squares.
Oblique-angle SEM of patterned microwells with the polymer layer in the squares intentionally thinner than the surrounding matrix (scale bar = 5 µm).

In order to evaluate differences between experimental and expected film thicknesses during the second deposition step, the resulting patterned surface was evaluated using atomic force microscopy (AFM). For this experiment, a patterned surface having 400 nm deep microwells was prepared from HEMA and PFA monomers (Figure 3.7). The swelling behavior of the films was characterized using a wet cell, operating in non-contact mode. AFM analysis, performed along the red line indicated by arrows in Figure 3.7., revealed a (maximum) depth of 385 nm, which is in good agreement with the expected values.

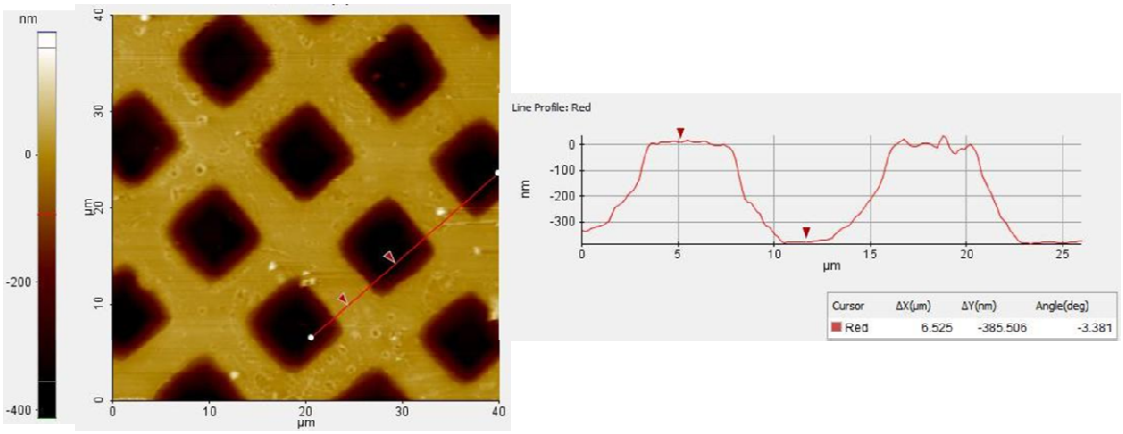

Figure 3.7. AFM of the microwells in its dry state.

A line scan between the points marked with arrows reveals the depth to be 385 nm.

The discrepancy in the expected and measured thickness may be explained due to inaccuracies in the interferometric measurement or partial removal of the polymer during mask lift-off. Indeed, the removal of the grid is a critical step that should be carefully controlled in order to avoid the introduction of defects or damages on the films. The tendency of the films to get damaged is intimately related to the thickness and the mechanical properties of the deposited films. The scope of this study has been limited to amorphous thin films, and it is likely that