

Confocal Raman Microscopy - Measurements on PS-PEP-PMMA samples

The alpha300 R combines a confocal microscope of extremely high optical throughput and resolution with a sensitive Raman spectrometer. With this instrument, it is not only possible to obtain Raman spectra from extremely small sample volumes (down to $0.02 \mu\text{m}^3$), but also to collect high resolution Raman images at maximum speed. In Raman Spectral Imaging, a complete spectrum is obtained at every pixel.

Due to the sensitivity of the setup, acquisition time per spectrum is typically in the millisecond range, so that images of 100×100 pixel can be obtained in a few minutes. In this study, a ball shaped polymer blend consisting of Polystyrene (PS), Polyethylenpropylen (PEP) and Polymethylmetacrylat (PMMA) on a silicon substrate was used to investigate the distribution of the different polymers.

While scanning the sample, a Raman spectrum was taken at each pixel. The accumulation time for one spectrum was 0.01 sec.

Fig. 1 shows a typical spectrum acquired with this setup. Two resulting images are shown in fig. 2.

Fig. 2: The two images show the integral intensities of the Raman bands from figure 1 which are marked in green (left image) and red (right image). The left image shows the PS as well as the other two polymers, whereas the right image shows only Polystyrene. Comparing the corresponding images suggests that spheres of PS are coated with a thin PEP-PMMA layer.

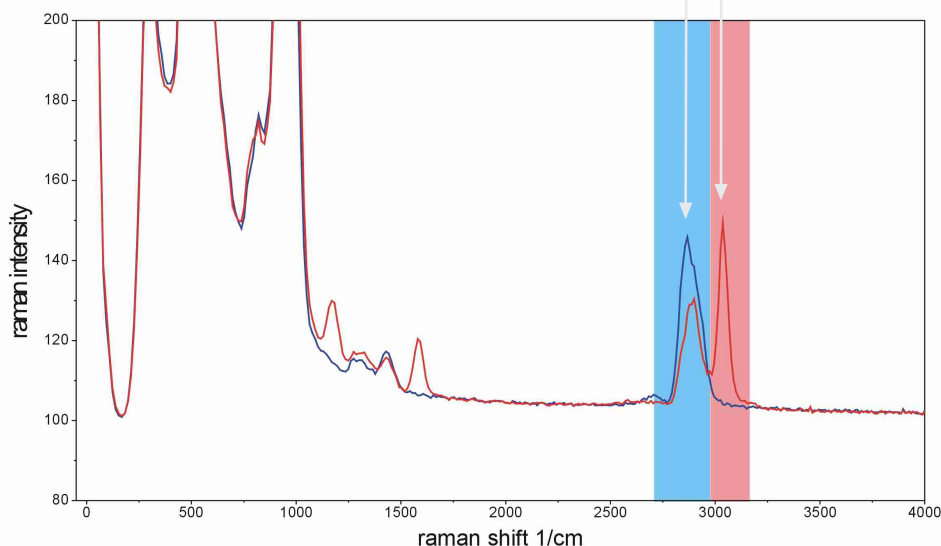
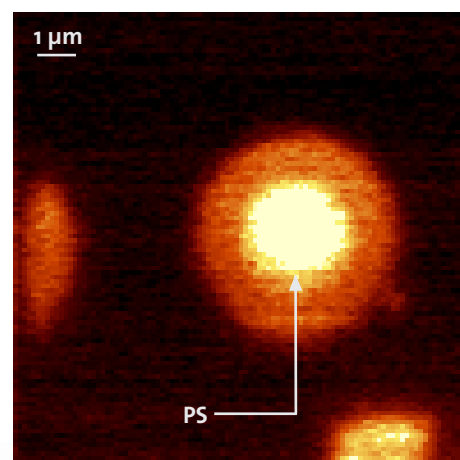
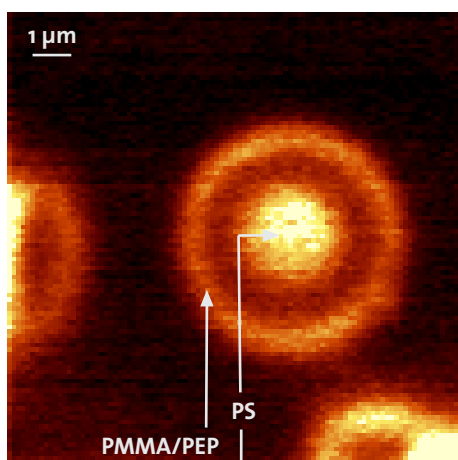


Fig. 1: Two typical Raman spectra of two different locations on the sample represent two different polymers.

Raman spectra on selected points

Following a scan in Raman Fast Imaging Mode it is possible for the piezo stage to move the sample to selected points of interest and acquire Raman spectra with a longer accumulation time. The complete Raman spectra of the two points marked in figure 3 are shown in the graph of figure 4.

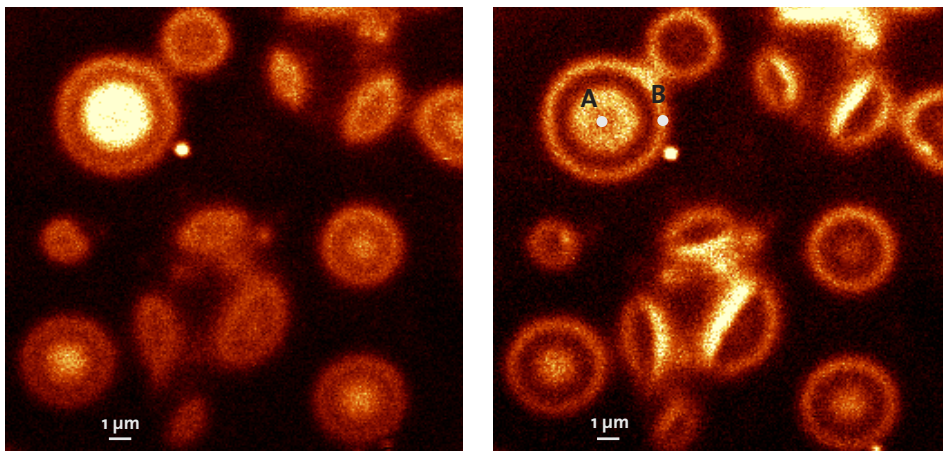


Fig. 3: Images taken with the Raman Fast Imaging Mode. Scan range is 20 µm x 20 µm with 256 x 256 pixel and an accumulation time of less than 9 ms per pixel. Left: CH-Stretching Polystyrene; right: CH-stretching all polymers

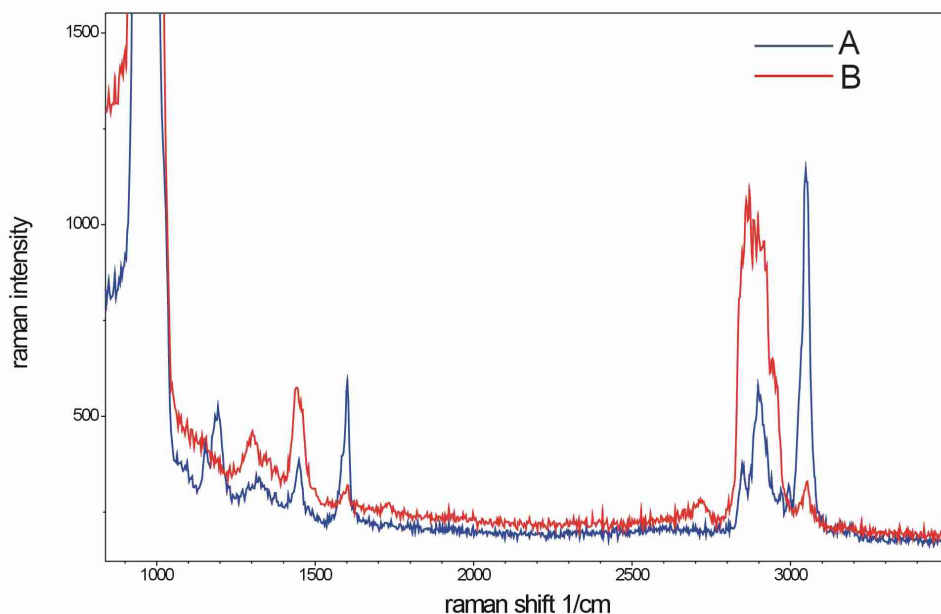


Fig. 4: Raman spectra at the points designated in fig. 3. Accumulation time: 5 s