# IMAGING UNDER PRESSURE

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In situ FTIR spectroscopy has proven to be a powerful tool to study materials subjected to high-pressure or supercritical fluids.[1] Conventional in situ spectroscopy probes interactions between supercritical (sc) $CO_2$ and materials at a molecular level and provides a fundamental understanding of the origin of many effects of sc$CO_2$ on polymeric materials (such as plasticisation, swelling, etc.). However, conventional FTIR spectroscopy lacks the advantage of the most basic photographic camera: obtaining a whole picture in a single snap shot. Fortunately, new infrared detectors have been developed recently that can do this by using infrared arrays that incorporate thousands of small detectors in a grid-pattern. The use of these array detectors is the basis of FTIR spectroscopic imaging. [2-5] This method relies on the ability of array detector to simultaneously measure spectra from 4096 different locations in a sample. In this new study we applied FTIR Imaging approach to study polymeric materials subjected to high-pressure $CO_2$. The spatial resolution achieved by this approach ranges from 4 µm to 60 µm. The enhanced chemical visualisation allowed us to measure the effects of $CO_2$ on the morphology of polymer blend, and simultaneously measure sorption of $CO_2$ into different domains of heterogeneous polymer blend. This is the first time that FTIR Imaging was applied under high-pressure in a previously unknown way to study materials in contact with supercritical fluid. Spectroscopic FTIR imaging opens a window of opportunities that would facilitate the understanding of materials processes with supercritical fluids. The implications of this novel imaging technology range from emulsions to drug release which will also be discussed.

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