# Chemical Imaging Under Pressure

S. G. Kazarian

Department of Chemical Engineering, Imperial College London, UK
e-mail: s.kazarian@imperial.ac.uk

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 lacks the advantage of the most basic photographic camera: obtaining a whole picture in a single snapshot. 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. In this study we applied FTIR imaging approach to study polymeric materials subjected to high-pressure $CO_2$. In situ imaging was achieved using a modified diamond attenuated total reflection (ATR) accessory.

The enhanced chemical visualisation using ATR-FTIR imaging 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.[2] Other examples of applications of this new chemical imaging technology in situ include imaging of ionic liquid droplet under high-pressure $CO_2$, observation of precipitation of elastin from aqueous solution subjected to high-pressure $CO_2$ [3] and imaging of phase separation in polymer/drug system. [4] This is the first time that FTIR imaging was applied under high-pressure in a previously unknown way to study simultaneously several polymeric 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.

1. KAZARIAN S. G. *Macromol. Symp.* Vol. 184, **2002**, 215.
2. KAZARIAN S.G. CHAN K. L. A. *Macromolecules*, Vol. 37, **2004**, 579.
3. DEHGHANI F., ANNABI N., VALTCHEV P., MITHIEUX S.M., WEISS A. S., KAZARIAN S. G., TAY F. H. *Biomacromolecules*, Vol. 9, **2008**, 1100.
4. PASQUALI I., ANDANSON J.-M, BETTINI R., KAZARIAN S. G., to be submitted.