# CRYOGENIC CHARACTERIZATION OF MATERIALS USING A NOVEL IR SPECTROSCOPY SYSTEM

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Porous materials primarily have their structural properties determined using materials science tools such as powder X-ray diffraction, solid-state NMR, and gas adsorption. Crystalline porous materials including covalent organic frameworks (COFs), metal-organic frameworks (MOFs), and zeolites can be seen to respond to external stimuli, like pressure, using diamond-anvil cells, but few experiments are capable of directly investigating the material's response to temperatures as low as 30K. Here, we show how our new cryogenic FTIR instrument is capable of observing structural changes in "flexible" COFs as a function of temperature, down to as low as 30K. Using a functionalized series of COF-300 materials, we show that different temperature-induced structural changes are revealed in situ through changes in the IR spectrum. Further comparison of the materials shows different degrees of change, both through the quantitative degree of the peak shift and a qualitative assignment of which peaks shift. Finally, we discuss the utility of this experimental technique for future gas-uptake and adsorption applications.