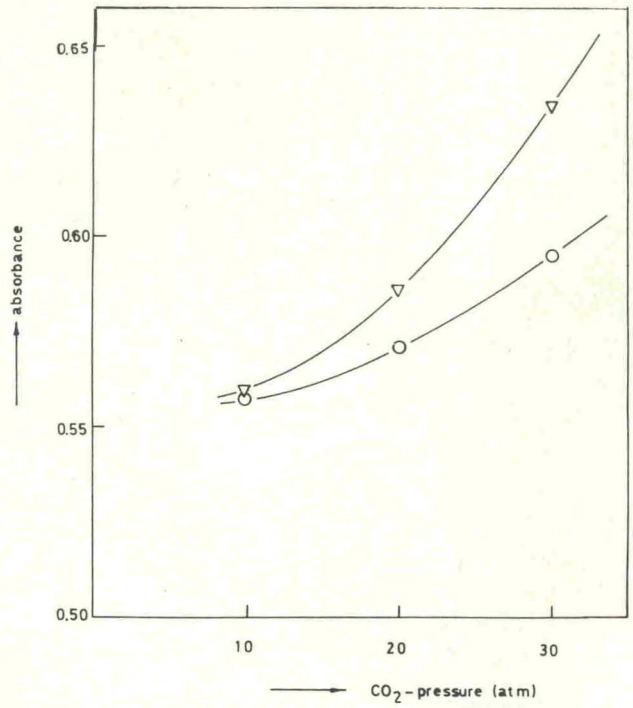

FIG. 5. Absorbance of the unidentate carbonate band at 1493—7435 cm^{-1} on CaY zeolite as a function of carbon dioxide pressure: ●—recorded under the appropriate pressure; ▲—recorded under vacuum.

APPLICATION

The described cell may be used to imvestigate a wide variety of gas–solid interactions at elevated temperatures and ultrahigh vacuum or high pressures. Figures 3 and 4 show examples of spectra recorded with the cell. A Perkin–Elmer grating spectrophotometer (model 325) was used to record the spectra. Figure 3 illistrates the dependency of the intensities of the O–H bands at 3640 and 3540 cm^{-1} and of the N–H band at 3400 cm^{-1} on a partially decationized NH_4–Y zeolite as a function of the pressure. With decreasing pressure a slight increase of the O–H bands and a decrease of the N–H band is observed. The O–H bands are produced by decomposition of NH_4^+ ions evolving ammonia.[11] The latter is adsorbed on the zeolite and is due to the N–H stretching band. The lower the pressure the more NH_4^+ ions are decomposed because the ammonia can more easily be desorbed from the zeolite surface. This explains the slightly higher intensities of the O–H bands and the lower intensity of the N–H band at lower pressures.

The absorption bands at 1493–1435 cm^{-1} in Fig. 4 are assigned to unidentate carbonate type species ($-O-CO_2$), which are formed by high temperature interaction of carbon dioxide with CaY zeolite.[12] The intensity of the doublet band at 1493–1435 cm^{-1} has been followed at 200°C as a function of the carbon dioxide pressure. Prior to recording of the spectra, the CaY zeolite has been contacted with carbon dioxide for 15 min at 200°C and the appropriate pressure. A continuous increase of the unidentate carbonate band is observed with rising pressure (Fig. 5). This increase is more distinctly marked if the spectra were recorded under vacuum after having contacted the zeolite with carbon dioxide.

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