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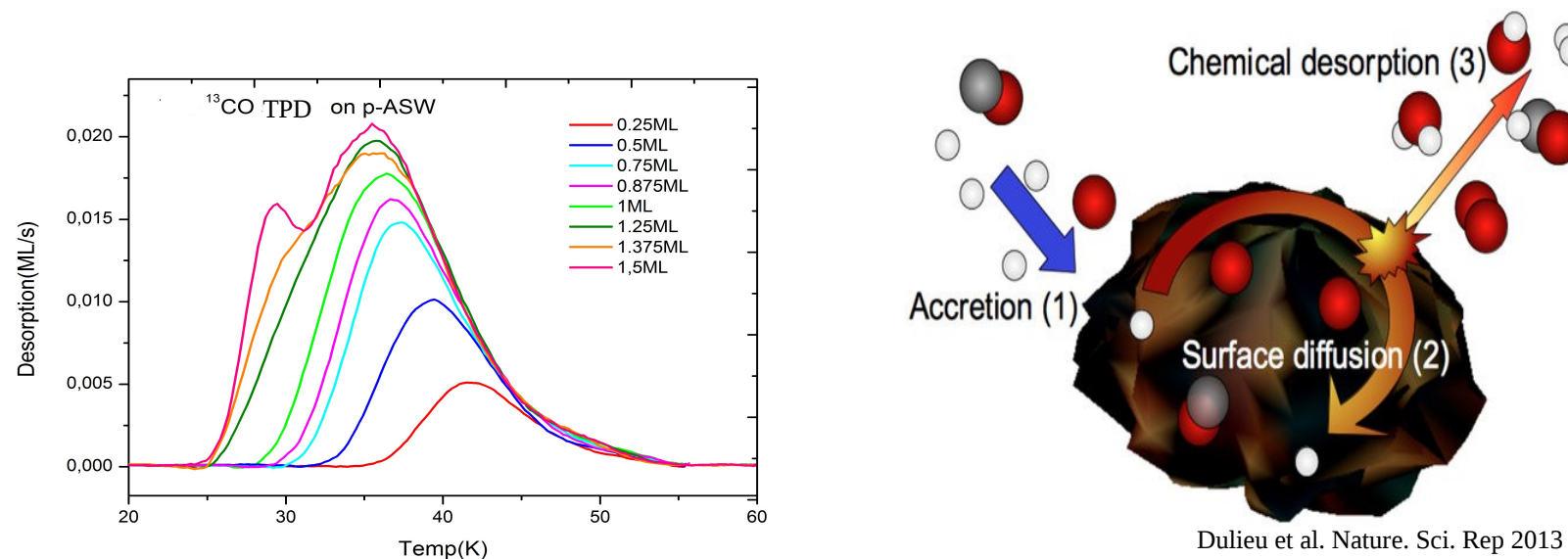
CONTEXT

CO and N₂ are two of the most abundant species in molecular clouds.
 + CO molecules are heavily depleted from the gas phase toward the centre of prestellar cores, whereas N₂ molecules still maintain a high gas phase abundance.
 + The reason of this difference is not understood because CO and N₂ have identical masses, similar sticking, and relatively closed the binding energies.



Experiments designed in the laboratory:
 + Different ice surfaces: Amorphous solid water (ASW) ice (i.e porous; compact) and crystalline ice.
 + UHV – Sub-monolayer regime.
 + Detections: Thermally Programmed Desorption (TPD).
 Quadrupole Mass Spectroscopy (QMS).
 Infrared Spectroscopy.
 + Molecular beams.

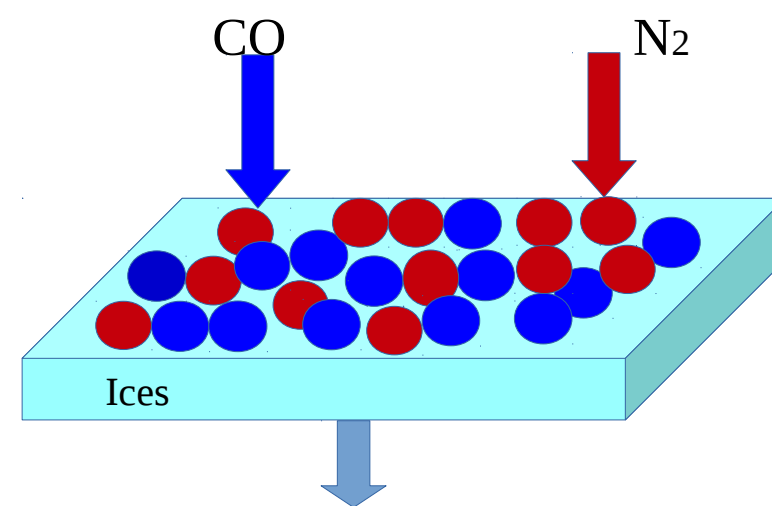
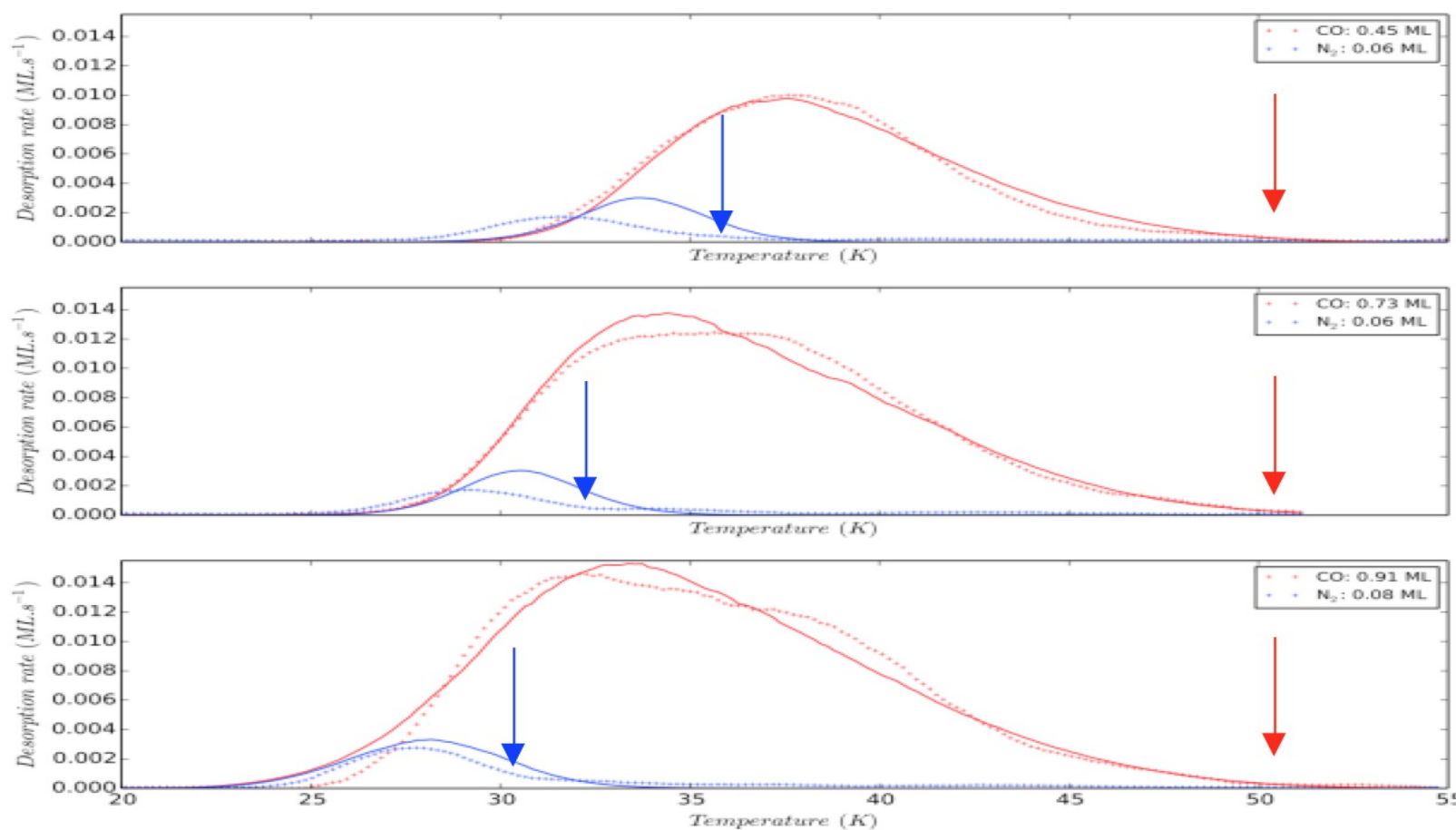
MONOLAYER CALIBRATION



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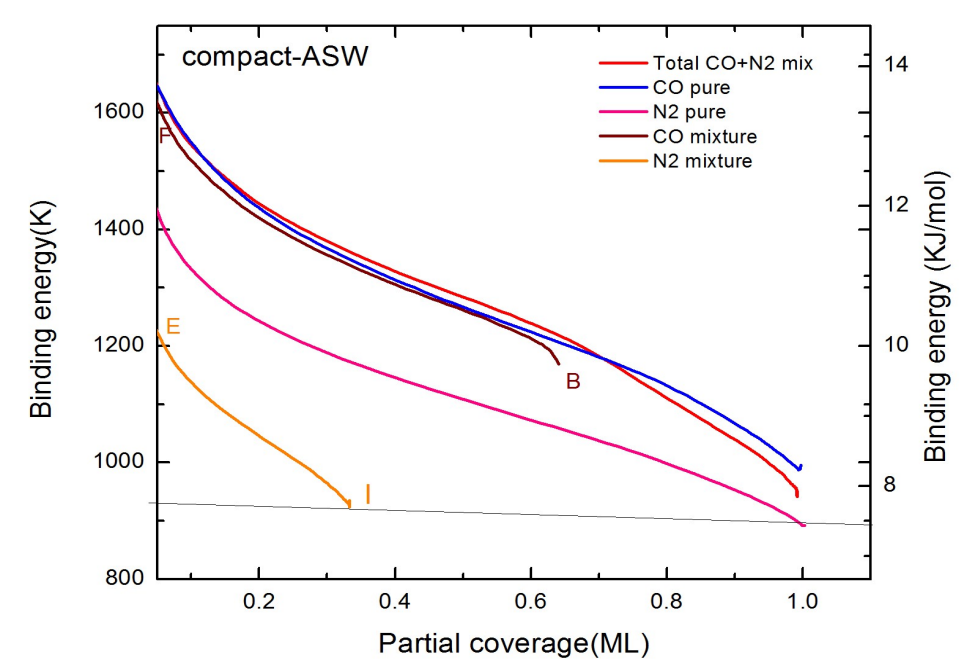
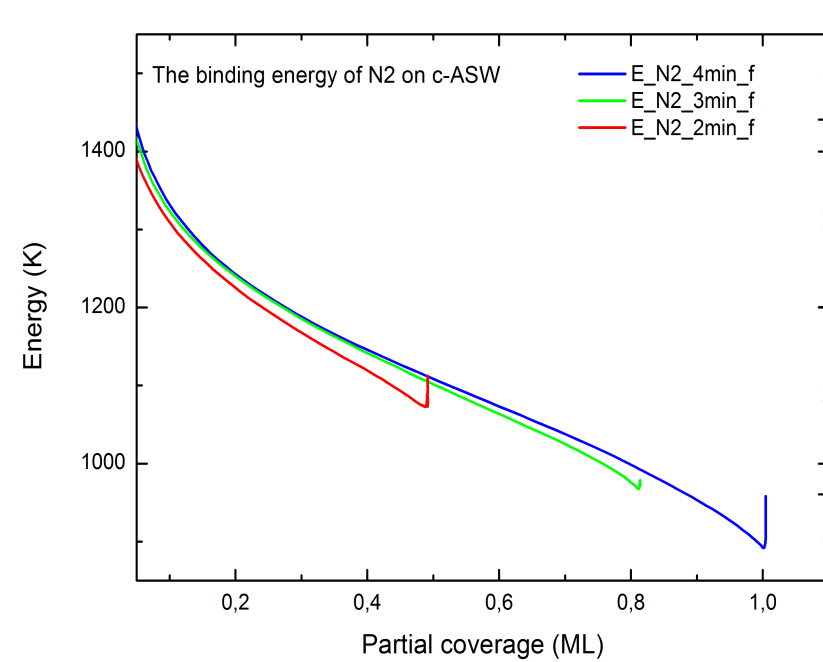
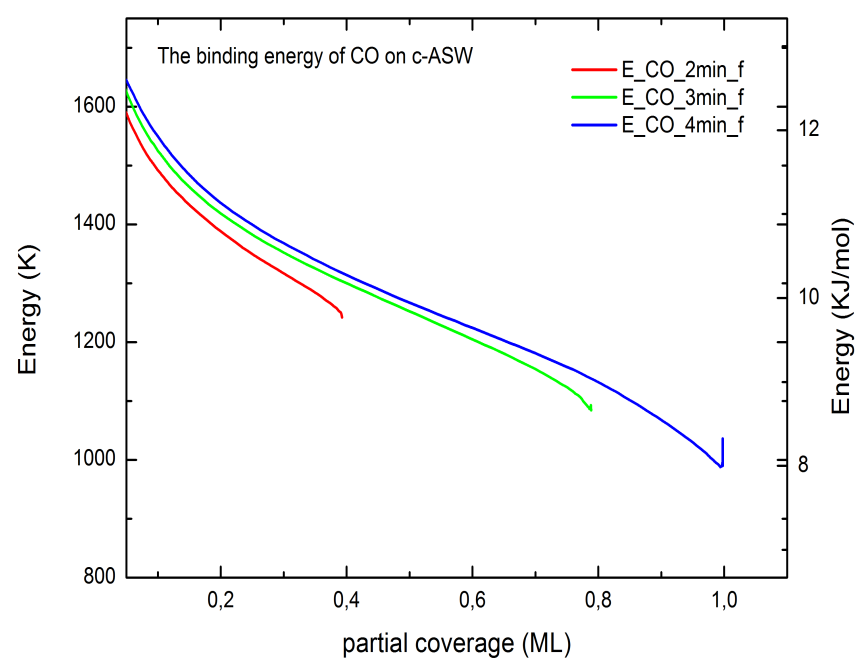
Thermal desorption. Deposition at 10 K and heating to 60 K of various co-doses.
 + CO molecules are deposited on porous ASW ice (10 K and 55 K annealing)
 + With the increase of the doses, temperature shifts towards lower values.
 + Surface density = 1.5×10^{15} molecules.cm⁻² on porous ASW ice.

CO AND N₂ MIXING



+ CO and N₂ are mixed in the same conditions at 10 K.
 + The CO desorption behavior does not change on the substrate when the molecular doses are raised (red arrows), while the N₂ desorption is shifted towards lower temperatures (blue arrows).
 + CO desorption behavior is not affected the N₂ presence, whereas N₂ desorption temperature is lowered by CO co-adsorption.

ANALYSIS OF BINDING ENERGY DISTRIBUTIONS



Pure	Coverage (ML)	N ₂	CO
	0.5	~ 1070 K - ~ 1380 K	~ 1250 K - ~ 1580 K
Edes	0.75	~ 960 K - ~ 1400 K	~ 1090 K - ~ 1590 K
	1	~ 890 K - ~ 1420 K	~ 990 K - ~ 1630 K

The mixture	N ₂ (from I to E)	CO (from B to F)	N ₂ + CO
Edes	~ 900 K - 1200 K	~ 1200 K - ~ 1600 K	~ 900 K - ~ 1600 K

+ The values of binding energy decrease with the coverage.

+ The CO desorption is coming after the N₂ desorption.
 + The N₂ desorption is affected the CO co-adsorption on the water ice surface.

CONCLUSION

+ CO and N₂ molecules are deposited on ASW ices and TPD are analysed.
 + The binding energy of CO and N₂ decrease with the coverage.
 + The N₂ desorption is affected the CO co-adsorption on the water ice surface => N₂ binding energy is lowered.

REFERENCES

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