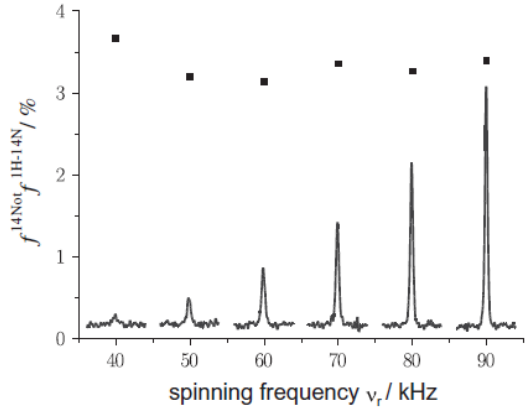
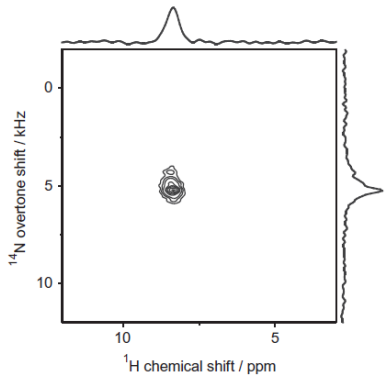
^{14}N overtone NMR spectroscopy

Nitrogen-14 has a spin quantum number of I = 1. Besides the allowed single-quantum transitions between I_z = 0 and I_z = +/- 1, there is a forbidden transition between I_z = +1 and -1. This transition is weakly allowed in the presence of quadrupolar couplings and can be excited by the rf-field with either the Larmor frequency (DQ: double quantum transition) or the twice of the Larmor frequency (OT: overtone transition). Here we show 1H-14N OT correlation spectra can easily be observed by 1H-14N OT HQMC experiments at ultrafast MAS rate. Since 14N OT is free from the first order quadrupolar broadening, the line shape are relatively narrow and affected only by 2nd order quadrupolar broadening. Although there still remain several issues in 14N OT spectroscopy, such as limited bandwidth, small transition moments, 14N OT spectroscopy opens a new world for us!

^{14}N OT filtering efficiency at various spinning rates



^{1}H-^{14}N OT HMQC spectrum of glycine at 90 khz MAS



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