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14N Nuclear Quadrupole Resonance of TNT

Summary

Nuclear Quadrupole Resonance (NQR) is one of the promising techniques for drugs and explosives detection in security applications. Another field emerging very recently is the development of fast methods to non-destructively determine counterfeit drugs. NQR's main advantage over most techniques is specificity, as the sample NQR frequency is almost unique, defined only by the quadrupole moment of the nucleus under observation and the sample specific electric field gradients. Unfortunately, the technique sensitivity is often low, requiring long experimental times. This is especially true for a very desirable nucleus ^{14}N . Here I present three techniques used to increase ^{14}N sensitivity which were applied to the detection of the explosive TNT:

- ☒ polarization transfer from ^1H to ^{14}N [1]
- ☒ the use of multipulse sequence spin-lock spin-echo [2], and
- ☒ the super-Q detection [3].

Whereas these techniques are very well known in the NMR/NQR community, they present some peculiarities when applied to TNT which are related to the occurrence of several closely spaced resonance lines.

Primary author: GREGOROVIČ, A. (Institute Jožef Stefan, Jamova 39, 1000 Ljubljana, Slovenija)

Co-authors: LUŽNIK, J (Institute for Mechanics, Physics and Mathematics, Jadranska 19, 1000 Ljubljana, Slovenija); PIRNAT, J (Institute for Mechanics, Physics and Mathematics, Jadranska 19, 1000 Ljubljana, Slovenija); APIH, T (Institute Jožef Stefan, Jamova 39, 1000 Ljubljana, Slovenija); TRONTELJ, Z (Institute for Mechanics, Physics and Mathematics, Jadranska 19, 1000 Ljubljana, Slovenija)

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