Preface

Researchers continue to find new applications for nuclear magnetic resonance (NMR) spectroscopy in the fields of physics, chemistry, material science, geology, biology, and medicine. As an impressive measure of the current scope of NMR research, one can find about 26,700 discrete references in the Web of Science Core Collection in the year 2020 alone. The corresponding reference numbers in 2000 and 1980 are 13,000 and 2,500, respectively. The portion of these studies focusing on solid-state NMR was about 20% of all NMR studies since the year 2000. Presently, about 400 papers per year deal with quadrupolar nuclei. Fewer than one-quarter of these, mainly ^{2}H studies, address integer spins; the remaining three-quarters or more deal with half-integer spins.

The study of quadrupole effects in the solid-state NMR of nuclei with half-integer spins began with the fundamental paper by R.V. Pound "Nuclear Electric Quadrupole Interactions in Crystals" [1], published in 1950; the early developments in this field are summarized in the 1957 review by M.H. Cohen and F. Reif, "Quadrupole Effects in NMR Studies of Solids" [2]. Jumping to the year 2012, we recommend the book edited by R.E. Wasylischen *et al.*, "NMR of Quadrupolar Nuclei in Solid Materials" [3], which contains 28 chapters [4-31] written by 40 specialists in this field. The recent enhancement of the sensitivity limits by dynamic nuclear polarization (DNP) is summarized in the 2018 review by F. A. Perras *et al.*, "Growing Signals from the Noise: Challenging Nuclei in Materials DNP" [32] and in the 2019 review by A.G.M. Rankin *et al.*, "Recent Developments in MAS DNP-NMR of Materials" [33]. Currently, developments are ongoing, particularly in the area of polarizing agents, see R. Wei *et al.* [34]. In 2020, the "Handbook of High Field Dynamic Nuclear Polarization" [35] edited by V.K. Michaelis, R.G. Griffin, B. Corzilius and S. Vega was published with contributions from 50 authors.

Since 2013 we update our own review [36], originally published in 1993. It was titled "Quadrupole Effects in Solid-State NMR" and was limited to nuclei with half-integer spins in powder samples. The present review covers the identical topic; we again exclude integer spins. Some parts of the previous review [36] survived. This means that the current review is not free of self-plagiarism. The use of text parts and equations from our previous review [36] is mostly not indicated. We also re-used the basic content of some tables about quadrupole parameters of powder materials and some text from our (D.F.'s) 2000 review [37].

In 1980, D. Freude and H.J. Behrens [38] carried out one of the first ^{27}Al MAS NMR studies of inorganic solids and D. Müller [39] began his series of work using this method. More than five thousand ^{27}Al MAS NMR studies have been published since then. Tables about the ^{27}Al, ^{23}Na and ^{17}O parameters of inorganic powder materials are supplemented in the last section, although it has become more difficult to keep up to date with the accelerating publication of relevant materials. Another very useful source is the comprehensive and regularly updated compilation of quadrupole effects and their applications in solid-state NMR, presented by P. Man on his internet page www.pascal-man.com.

With the present work, we address the readership of our old review with many thanks for consulting it and with the hope that the present version will merit its recommendation to others. We would much appreciate any advice concerning mistakes or other deficiencies in our presentation, as well as any suggestion for extension. The present review is presented only on the Internet and will be casually updated. Please use, as its reference,
D. Freude and J. Haase, www.quad-nmr.de (2013−2024).

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