

Preface

This book originates from activities in connection with a research unit at the Department of Chemical and Process Engineering of the Universität Karlsruhe (TH), now Karlsruhe Institute of Technology (KIT), applying nuclear magnetic resonance (NMR) in engineering sciences.¹ The actual research was accompanied by frequent seminars and scientific events. A lecture intended mainly for the Ph.D. students involved in the projects was implemented.² The presented NMR fundamentals are an extension of this lecture. Frequent tasks of quantitative image analysis are summarized later. In the experimental part, also specific hardware developments are described. The presented applications equally originate from this research unit.

The text is mainly intended for readers with engineering background applying NMR methods or considering to do so. Quantum mechanics are avoided in favor of a classical description. However, the relevant equations are worked out. Simple problems with solutions allow to check whether the fundamentals are understood.

Many persons from Karlsruhe contributed to this book. Prof. Buggisch initiated the research unit and led it with exceptional competence. He also thoroughly scrutinized the German version of this text. Prof. Nirschl suggested the idea of this book. Prof. Reimert organized the continuation of the research unit after the DFG funding as well as Prof. Kasper, Prof. Kind, Prof. Nirschl, and Prof. Elsner. Prof. Nirschl, Prof. Kind, Prof. Wilhelm, and Prof. Elsner contributed in the establishment of the shared research group confided to Dr. Guthausen, extending in particular research involving low-field NMR. I especially owe thanks to Mr. Mertens for his engaged and successful work on the rheometry project with Dr. Hochstein. Fortunately, it could be further developed into combined rheo-TD-NMR, thanks to Dr. Nestle and Dr. Wassmer from BASF SE, Ludwigshafen, and Ms. Herold. Technical assistance from Mr. Oliver and the workshops is gratefully acknowledged.

¹Forschergruppe 338 der Deutschen Forschungsgemeinschaft (DFG) “Anwendungen der Magnetischen Resonanz zur Aufklärung von Stofftransportprozessen in dispersen Systemen,” 1999–2005.

²Magnetic Resonance Imaging: Fundamentals and Applications in Engineering Sciences.

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