Preface to the Third Edition

Analytical sciences do not stand still, much technical advancement became routine for new solutions and increased productivity. GC-MS instrumentation, the undisputed workhorses in the analytical laboratories, made significant steps ahead with higher integrated, automated sample preparation and extraction methods, and improved matrix robustness, selectivity for real-life samples and the growing potential for multi-compound methods.

Major impact on standardized methods came from the wide distribution of the QuEChERS methodology and from extraction micro-methods such as the solid-phase microextraction (SPME). QuEChERS is on its way beyond the successful utilization for pesticides into environmental and drug applications. New micro-methods allow an easy handling by robotic autosamplers. Not unexpected, also mass spectrometric detection advanced, not in sensitivity, but significantly in selectivity, which translates for sure into sensitivity when analysing "dirty" real-life samples from less cleaned multi-method extracts. In particular, triple quadrupole mass spectrometry became a new standard for routine target compound analysis for many hundreds of compounds in one analytical run, providing unprecedented productivity for trace analyses. With this high-target analyte capacity, triple quadrupole GC-MS/MS instruments replace more and more, the initially highly successful but capacity limited, ion-trap technology. Accurate mass measurements are on the verge in GC-MS, extending the targeted analysis approach into the realm of untargeted trace compound analysis.

This third edition of the *Handbook of GC-MS* reflects the changing analytical requirements in GC-MS analysis with significant technology updates, additions of new fundamenttal topics and new applications based on current best practice methods.

Special focus has been set to the widely used and popular sample preparation methods as there are the pressurized liquid extraction (PLE), the thermal extraction of materials and food (outgassing), and in detail on the QuEChERS pesticide sample preparation used for GC-MS and LC-MS. As a consequence of the higher matrix load of these extracts and the recommended GC injection techniques, concurrent backflush, preventive maintenance and inlet deactivation became current topics of discussion. Olfactometry solutions have been added for applications in flavour analysis.

The applications section was updated with best practice solutions as of present demand from many laboratories. The sections describing the analytical conditions have been standardized and provide the complete method details for reproduction of the application in the reader's laboratory.

The selection of applications, due to the limited capacity of the Handbook, puts special focus on the following:

- Volatile analysis with static and dynamic headspace, multiple headspace extraction (MHE), as well as thermal desorption
- Pesticide analysis with multi-methods using single and triple quadrupole instruments and QuEChERS sample preparation
- Food safety and environmental analysis including most recent developments of the versatile SPME method
- Metabolomics analyses workflow using GC-MS/MS for identification and quantitation
- Persistent organic pollutants (POPs) analysis covering dioxins, polychlorinated biphenyls (PCBs) and the brominated flame retardants (BFRs), also featuring "Fast GC" for increased sample throughput
- Drugs of abuse screening from hair or urine matrices
- Extractables, leachables and outgassing analysis from leather, textiles, car interior materials or food

This third edition of the *Handbook of GC-MS* is a comprehensive update of current best practice GC-MS methodology compiled from practical laboratory work. It would not be possible without the contribution and support of many colleagues from analytical laboratories or from the analytical instruments industry, driving innovation and implementing new solutions for successful analytical methods. In particular, I am greatly indebted to the contributions, discussions and comments provided by Mike Buchanan from Sigma-Aldrich/Supelco; Dave Hope and Pat Pond from the Pacific Rim Lab in Vancouver, Canada; Chris Llewellynn and Elizabeth Woolfenden from Markes International in Llantrissant, UK; Cindy Llorente, Rosario Jimenez and Nese Sreenivasulu from the International Rice Research Institute (IRRI) in Los Banos, Philippines; Professor Hans-Ulrich Melchert, retired from the Robert Koch Institute in Berlin, Germany; Professor Janusz Pawliszyn from the University of Waterloo in Canada; Peter Pichler from the Brechbuehler AG in Schlieren, Switzerland. I am also grateful to my directly collaborating colleagues at Thermo Fisher Scientific Alex Chen in Melbourne, Australia; Benedicte Desroy in Villebon-sur-Yvette, France; Inge de Dobbeleer in Breda, Netherlands; Silvia Gemme and Jeremy Matthews in Singapore; Joachim Gummersbach in Dreieich, Germany; Aarti Karkhanis and Soma Dasgupta in Mumbai and Kolkata, India; Dirk Krumwiede and Heinz Mehlmann in Bremen, Germany; Paolo Magni and Massimo Santoro in Rodano, Italy; and Chongtian Yu in Shanghai. Also, I would like to thank as well the many communicating readers of previous editions providing valuable comments and feedback.

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