

Preface

The use of microwave energy in chemical laboratories was first described in 1986 contemporaneously by R. Gedye and R.J. Giguere in organic synthesis and by K. Ganzler in the extraction of biological matrices for the preparation analytical samples. Since then, several laboratories studied the enormous potential of this non-conventional energy source for synthetic, analytical and processing application. So far, the use of dielectric heating in synthesis and extraction is documented by over 3,000 and 1,000 articles respectively.

The field of microwave-assisted extraction of bioactive compounds is quite young. In the last two decades, new investigations have been prompted by an increasing demand of more efficient extraction techniques, amenable to automation. Shorter extraction times, reduced organic solvent consumption, energy and costs saved, were the main tasks pursued. Driven by these goals, advances in microwave extraction have resulted in a number of innovative techniques such as microwave-assisted solvent extraction, vacuum microwave hydro-distillation, microwave Soxhlet extraction, microwave-assisted Clevenger distillation, compressed air microwave distillation, microwave headspace extraction, microwave hydro-diffusion and gravity, and solvent-free microwave extraction. One of the success stories of the twenty-first Century has been the partial replacement of conventional extraction processes, with “green” procedures (reducing energy, time, solvent, and waste) based on microwave irradiation.

Scope of this book is to present a detailed survey on the full potential of microwaves in extraction processes. Following an introduction to microwave theory (Chap. 1), Chap. 2 details mass and heat transfer, induced by microwave, in solid-liquid extraction as a unit operation in chemical and food engineering. Applications in which microwave-assisted-extraction have afforded spectacular results and applications are discussed extensively in term of process and product: essential oils (Chap. 3), fat and oils (Chap. 4), antioxidants and colours (Chap. 5), proteomics (Chap. 6), and pharmaceutical and nutraceutical compounds (Chap. 7). The last Chap. (8) give responses to major questions to convert laboratory innovations into industrial success for microwave-assisted extraction: scale-up, quality and safety consideration....

This book has been prepared by a team of chemists, biochemists, chemical engineers, physicians, and food technologists who have extensive personal experience in research and development of innovative microwave extraction processes and products at laboratory and industrial scale. This book addresses primarily to science graduate students, chemists and biochemists in industry and food quality control, as well as researchers and persons who participate in continuing education and research systems.

We wish to thank sincerely all our colleagues who have collaborated in the writing of this book. We hope to express them our scientific gratitude for agreeing to devote their competence and time to ensure the success of this book.

Avignon, France
Torino, Italy

Farid Chemat
Giancarlo Cravotto