

# Preface

Ultrasonic technology has been increasingly used in synthetic applications despite its existence over a century for traditional industrial applications such as cleaning, extraction and emulsification. Over the past few decades, the potential use of ultrasound in synthetic reactions has been explored in laboratory-scale experiments. Due to unique and extreme reaction environment generated within cavitation bubbles, in otherwise a room temperature liquid, a variety of functional materials could be synthesised.

A number of books and review articles are available in the literature highlighting the benefits of ultrasound-driven chemical reactions including synthesis of materials. However, a textbook-style Brief on the use of ultrasound for synthesising functional materials is not available. As discussed in this Brief, functional materials are used by the human society for various purposes that include catalysis, energy conversion, biomedical applications, nutritional foods, etc. Ultrasonic synthetic methodology offers a relatively simple and green route to synthesise such functional materials.

Chapter 1 of this Brief provides fundamental science involved in ultrasonic synthesis of functional materials. How sound waves interact with gas bubbles in liquids and what are the consequences of such interactions that lead to the generation of a variety of chemical reactions are discussed in this chapter. Specific examples of ultrasonic synthesis of functional materials that include inorganic and organic nanomaterials, core-shell microspheres and functional foods have been highlighted in Chap. 2. The advantages, disadvantages and challenges of ultrasonic technology are briefed in Chap. 3.

The Brief on ultrasonic synthesis of functional materials will benefit wider academic and student communities as it provides a snapshot of both fundamental and applied aspects of past and recent developments in this developing research area. In addition, it may also benefit various industry sectors willing to embrace a novel technology in materials synthesis and food processing.

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