Guest editorial

Microwave energy: a green synthesis and treatment solution

DOI 10.1515/gps-2015-0111

Heating and treating with microwave energy is a green and highly efficient technique for various thermal processes. The advantages of microwave heating over conventional processing methods include: non-contact heating; energy transfer, not heat transfer; rapid heating; material selective heating; volumetric heating; heating starts from the interior of the material body; clean and green synthesis; higher level of safety and automation.

Technologies based on microwaves have found applications in the fields of telecommunications, food processing, medical waste remediation, environmental protection, chemical engineering, material preparation and mineral processing. Some microwave-based metallurgical processing techniques for drying, sintering and other chemical reactions have been demonstrated to have 10–20% improved efficiency over techniques that do not use microwaves. Microwave heating, drying, sintering, nanomaterials preparation and even medical diagnosis and treatment have faster kinetics, and are more energy efficient than several other competing processing techniques.

Thus, as microwave treatment is a promising green technology in the field of process intensification and green synthesis and treatment, in this special issue we include some of the research papers of Professor Jinhui Peng's group, an active research group in the field of microwave application in Kunming University of Science and Technology (KUST), China.

For more than two decades, Professor Jinhui Peng's group has maintained an active research and development program focused on the application of microwaves in extractive metallurgy. Liu et al. [1] published one of the early papers in this field, detailing the behavior of different minerals heated under microwave irradiation and results from microwave-assisted chlorination of sulfide minerals using ferric chloride.

In recent years, the work at KUST has expanded to various other applications of microwaves including: (i) carbothermic reduction of metal oxides; (ii) clean drying; (iii) dechlorination of metallurgical valuable by-products; (iv) preparation of activated carbon with high surface area; (v) generation of clean hot air; (vi) heating of highly corrosive pickling acid for cold rolled titanium alloy coils; and (vii) drying of water based paints.

Funding: National Natural Science Foundation of China, (Grant/Award Number: 'No. 51104073', 'No. 51264022').

Reference

[1] Liu C, Xu Y, Hua Y. *Chin. J. Met. Sci. Technol.* 1990, 6, 121–124.

Shaohua Ju
Faculty of Metallurgy and Energy Engineering, Kunming University of Science and Technology, Kunming, China
e-mail: shj_200801@126.com