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# Particle sizing with improved genetic algorithm by ultrasound attenuation spectroscopy

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**Abstract:** As a global optimization algorithm, genetic algorithm is an advantageous tool due to its global convergence, great robustness, suitable for parallel computing and so on. Selection of optimal parameters, e.g., maximum generations, population size, and genetic operators (crossover fraction and mutation fraction), is extremely crucial for particle size characterization by ultrasound attenuation spectroscopy with genetic algorithm. A series of particle system with different distribution functions were numerically investigated in this work. It revealed that the simulated results were consistent with the given particle size distribution when the maximum generations, population size crossover fraction and mutation fraction were appropriate chosen. Furthermore, the anti-noise performance of genetic algorithm and its three improved forms applied in particle system with bimodal distribution were also studied. Two groups of samples (micron-sized glass beads-glycerol suspension and aqueous polystyrene suspension) were investigated experimentally by ultrasound attenuation spectroscopy, and it showed a good agreement between Improved Genetic Algorithm 3 (IGA3) and microscope image analysis (MIA).

**Keywords:** Ultrasound spectroscopy; Particle sizing; Inversion; Genetic algorithm; Optimized parameter

## 1. Introduction

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