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# Drag coefficient fluctuation prediction of a single bubble rising in water

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**Abstract:**

The drag coefficient has a significant effect on the calculation of bubble motion. This paper experimentally investigated the drag coefficient of a single bubble rising in deionized water with the help of a high-speed video system. First, it is found that the terminal velocity presented periodical fluctuation, indicating that the drag coefficient is not a constant value. Then the measured drag coefficient was compared with correlations available in literatures. The comparison shows that these correlations cannot give fully satisfactory results in predicting the fluctuated drag coefficient. Based on messive data analysis, a new correlation combined Reynolds number, Eotvos number and Weber number was proposed to calculate the fluctuation of drag coefficient. The drag coefficient predicted by this new model is in excellent agreement with the experimental results over the range of $550 \leqslant Re \leqslant 1700$,and the largest relative error is less than 0.4%. Comparing with data of water from existing literature under the condition of $8<Re<12000$ and $0.01<Eo<600$, the proposed model gives better predictions than available drag models.

**Keywords:** Drag coefficient fluctuation; Bubble; Rising velocity; Drag correlation

## 1 Introduction

The motion of a bubble rising in water is of great importance in chemical engineering processes such as gas-liquid mixing and separation. For example, its direct application in



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