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Investigation of sedimentation process of soluble spherical particles in a Non-Newtonian medium

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ABSTRACT

In this work, transient movement of a vertically falling soluble spherical particle in a non-Newtonian medium is perused. It is supposed that the particle mass diminishes owing to its solubility in the fluid, and thus particle size will be diminished by a linear function. The governing nonlinear differential equation is solved analytically using Collocation Method (CM). The impacts of the effective parameters of this study are examined on the velocity and acceleration. Further, the positions of the particle are portrayed graphically at every 1 s time trend. Also, the limiting cases are gained and are found to be in good compromise with the numerical and literature results. The outcomes portray that the particle with a larger rate of diameter diminution moving with larger velocity rather than smaller diameter particle.

Keywords: Non-Newtonian medium; Drag coefficient; soluble particle; Unsteady motion; Sedimentation; Collocation Method (CM)

1. Introduction

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