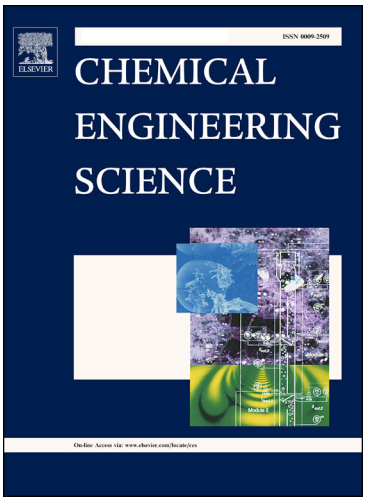

Short Communication

Flow past a rotating sphere in a non-Newtonian, power-law fluid, up to a Reynolds number of 10000

Asterios Pantokratoras

PII: S0009-2509(18)30098-8
DOI: https://doi.org/10.1016/j.ces.2018.02.036
Reference: CES 14060

To appear in: *Chemical Engineering Science*

Received Date: 10 September 2017
Revised Date: 18 February 2018
Accepted Date: 19 February 2018

Please cite this article as: A. Pantokratoras, Flow past a rotating sphere in a non-Newtonian, power-law fluid, up to a Reynolds number of 10000, *Chemical Engineering Science* (2018), doi: https://doi.org/10.1016/j.ces.2018.02.036

Flow past a rotating sphere in a non-Newtonian, power-law fluid, up to a Reynolds number of 10000

Asterios Pantokratoras

School of Engineering, Democritus University of Thrace,
67100 Xanthi – Greece:
e-mail:apantokr@civil.duth.gr
(corresponding author)

Abstract
The flow induced by a sphere rotating inside an incompressible, non-Newtonian, power law fluid has been investigated numerically. The rotating sphere is enclosed in a concentric cubic box with solid boundaries. The fluid power-law index varied between 0.2 and 2 thereby covering both shear-thinning and shear-thickening fluids and the Reynolds number varied between 0.01 and 10000. Numerical predictions show significant differences between shear-thinning and shear-thickening fluids. In the first case the flow is confined near the sphere whereas in the second case the flow extends up to the box plates. In creeping flow and shear-thinning fluids the torque is independent of the Reynolds number.

Keywords: rotating sphere, non-Newtonian fluid, power-law, torque