J. of Ramanujan Society of Mathematics and Mathematical Sciences
Vol. 10, No. 2 (2023), pp. 61-76

DOI: 10.56827/JRSMMS.2023.1002.5 **ISSN (Online): 2582-5461**

ISSN (Print): 2319-1023

EXISTENCE AND UNIQUENESS OF THE WEAK SOLUTION FOR A NONLINEAR REACTION-DIFFUSION SYSTEM IN SPACES BY SOBOLEV

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(**Received:** *Sep. 08, 2022* **Accepted:** *Apr. 12, 2023* **Published:** *Jun. 30, 2023)*

Abstract: In this article, we present a weak solution existence result for a system of equations involved in the mathematical modeling of the flow of an inhomogeneous viscous and incompressible fluid. For this, two results have been established. In the first result, the differentiability is according to Frechet. In the second result, the differentiability is understood in a weaker sense than that of Frechet.

Keywords and Phrases: Uniqueness and differentiability, compressible system.

2020 Mathematics Subject Classification: 35D30, 35A01, 35A02.

1. Introduction

We consider a reproductive flow of a viscous, incompressible and inhomogeneous fluid (variable density) in a domain $\Omega \subset \mathbf{R}^d$ (d = 2 or 3) during an observation interval $[t_0, t_f]$. Let ϑ be the speed of the fluid, η the coefficient of viscosity, ρ the density and $\pi = \pi(x,t)$ the pressure. The model is then described, (see for example [10 , 9]) by the following equations

$$\partial_t(\rho\vartheta) + div(\rho\vartheta \otimes \vartheta) - \mathscr{B}\vartheta + \nabla\pi = \rho\, f_e \tag{1}$$