

Time global existence and finite time blow-up criterion for
solutions to the Keller-Segel system coupled
with Navier-Stokes fluid

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Abstract

We deal with the chemotaxis model under the effect of the Navier-Stokes fluid, *i.e.*, the incompressible viscous fluid. We shall show the existence of a local *mild solution* for large initial data and a global *mild solution* for small initial data in the scale invariant class. Our method is based on the perturbation of linearization together with the $L^p - L^q$ -estimates of the heat semigroup. As a by-product of our method, we shall prove the smoothing effect and uniqueness of our *mild solution*. In addition, we shall show a blow-up criterion which almost covers the well-known threshold number 8π of the size $\|n_0\|_{L^1(\mathbb{R}^2)}$ under the rest state of the fluid motion. Furthermore, the blow-up rate will be also discussed. This is based on a joint work with Professor Hideo KOZONO(Waseda university) and Mr. Masanari MIURA (Kyushu university).