Weak martingale solutions to stochastic Navier-Stokes-Cahn-Hilliard system with transport noise

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In this talk, we investigate the weak solvability of an initial boundary value problem known as the Navier-Stokes-Cahn-Hilliard system, which describes the dynamics of a homogeneous, incompressible and isothermal mixture of two immiscible Newtonian fluids flowing in a bounded 2D or 3D domain under stochastic perturbations.

We assume that the density and viscosity of the mixture are constants and, to prove the existence result, we consider an approximation problem and use the Jakubowski-Skorohod Theorem to prove that the laws of the corresponding solutions on a certain non-metric topological space Z_T have a sequence weakly convergent to a new probability measure on Z_T.

Now, by following the argument of Mikulevicius and Rozovskii in their paper (Ann. Probab. 33(1) (2005), 137--176) with some modifications, we prove that the canonical process on the space Z_T is in fact a martingale solution of our problem with respect to the new probability measure.

The approach is quite interesting compared to the existence approach in the literature, since we combine both the Jakubowski-Skorohod theorem and the Mikulevicius and Rozovskii argument to deal with our problem.