Abstract Submitted
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Schmidt-number dependence of scalar fluxes and spectra in isotropic turbulence with a mean scalar gradient[1] TATSUYA YASUDA, Nagoya Institute of Technology; Keele University, TOSHIYUKI GOTOH, TAKESHI WATANABE, IZUMI SAITO, Nagoya Institute of Technology — We study the Schmidt-number dependence of scalar fluxes and spectra in isotropic turbulence with a uniform mean scalar gradient using the spectral scalar variance equation and Legendre polynomial expansions. For this purpose, we perform direct numerical simulations. In order to sustain statistically stationary isotropic turbulence, we input velocity fluctuations at moderate wavenumbers so that the computational domain of periodic box becomes much larger compared to the velocity integral length scale. The Taylor-microscale Reynolds number being approximately 150, we vary the Schmidt number from unity to 1/4096. Accordingly, the Péclet number based on the scalar Taylor microscale varies from 80 to 0.5. When the Schmidt number is very low, the second-order Legendre contribution of shell-summed scalar variance spectral density is almost as significant as the zeroth-order one at any wavenumber. Besides, very large-scale scalar structures emerge which are elongated along the direction of the mean gradient. The formation of such anisotropic structures is due to very rapid scalar diffusion and the mean scalar gradient.

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