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Convective instabilities in a ferrofluid with a viscoelastic carrier fluid HARALD PLEINER, Max Planck Institute for Polymer Research, Mainz, Germany, JAVIER MARTINEZ-MARDONES, Instituto de Física, Pontificia Universidad Católica de Valparaíso, Chile, LAURA PEREZ, Departamento de Ingeniería Metalúrgica, Universidad de Santiago de Chile, DAVID LAROZE, Max Planck Institute for Polymer Research, Mainz, Germany, Instituto de Alta Investigación, Universidad de Tarapacá, Arica, Chile — We report theoretical and numerical results on the convective instability for a ferrofluid in a viscoelastic carrier liquid. Such a system exhibits several features that are important for the onset and development of convective instabilities, like the Soret or thermodiffusive effect due to the binary mixture nature, shear thinning or thickening, stress retardation and normal stress generation due to the viscoelasticity of the carrier liquid, and the Kelvin force and magnetophoresis due to the ferromagnetic structure of the colloidal particles. Convective instabilities can be triggered by applying temperature (concentration) gradients and/or (homogeneous) magnetic fields. We systematically investigate the role of the various effects (and their mutual interplay) for the instability and bifurcation behavior. In particular, for oscillatory instabilities nonlinear magnetic and nonlinear viscoelastic properties are taken into account.

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