Thermomagnetic instability of a ferrofluid confined between two concentric cylinders[1]
ANTOINE MEYER, INNOCENT MUTABAZI, Normandie Université, UNIHAVRE, CNRS UMR 6294, LOMC, 76058, France, MARIE-CHARLOTTE RENOULT, ROMAIN CANU, Normandie Université, INSA ROUEN, CNRS UMR 6614, LOMC, 76000, France, INFEMA TEAM
— The stability of a ferrofluid confined between two coaxial differentially heated cylinders of infinite length is investigated through a linear stability analysis. A vertical current flux at the center of the cylindrical annulus creates a radially dependent magnetic field in the gap. The differential magnetisation of the ferrofluid due to stratification of the temperature and of the magnetic field produces the Kelvin's body force which can be seen as a buoyancy generated by a magnetic gravity. The centripetal magnetic gravity can destabilize the flow leading to three-dimensional vortices. The stability conditions as well as the spatial and temporal properties of these instabilities are given for different radius ratios and different fluid properties. An energy analysis complet this investigation in order to evaluate the contribution of thermomagnetic coupling at the onset of convective flows.

Antoine Meyer
Normandie Université