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Dipolar condensed atomic mixtures and miscibility under rotation

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By considering symmetric and asymmetric dipolar coupled mixtures (with dysprosium, erbium and rubidium isotopes), we reporta study on relevant anisotropic effects, related to spatial separation and miscibility, due to dipole-dipole interactions (DDI) in rotating binary dipolar mixtures Bose-Einstein condensates [1].
The binary mixtures are kept in strong pancake-shaped trap, with repulsive two-body interactions modeled by an effective two-dimensional coupled Gross-Pitaevskii equation. The DDI are tuned from repulsive to attractive by varying the dipole polarization angle. A clear spatial separation is verified in the densities for attractive DDI, being angular for symmetric mixtures and radial for asymmetric ones. Another relevant outcome is the observed mass-imbalance sensibility verified by the vortex-pattern binary distributions in symmetric and asymmetric-dipolar mixtures, which requires the use of a relation for nonhomogeneous mixtures to estimate the miscibility of two components.

References:
[1] R.K. Kumar, L. Tomio and A. Gammal,
Spatial separation of rotating binary Bose-Einstein condensates by tuning the dipolar interactions, Phys. Rev. A {\bf 99}, 043606 (2019); id.,
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