

# Ultra-fast spin dynamics of nanoparticles for bio-applications

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Hyperthermia therapy is a therapeutic treatment to kill targeted cancer cells in a body. However, the realization of its full clinical potential has been limited by an insufficient amount of intrinsic specific loss power. To overcome this obstacle for conventional hyperthermia methods, we have studied the resonant magnetization dynamics of magnetic particles of different sizes, including uniform magnetization precession and vortex-core precession[1,2]. Since such magnetization dynamics are followed by energy dissipation owing to the intrinsic damping of spin precession, low-power-driven heat generation can be achievable.[3,4] In this talk, we introduce the relevant characteristic spin dynamics of nanoparticles and show how such novel dynamic behaviors can be used for heat generation; additionally, we present an amazing result of heat generation rates, the values of which have yet to be recorded for conventional magnetic hyperthermia. This work may offer a precisely controllable and highly efficient means of heat generation for magnetic hyperthermia using FDA-approved magnetic particles and its novel spin dynamics.

## References

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