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Issue 24

nanoHUB in Research: Magnetic Textures

Smiljan Vojkovic, a graduate student seeking a Master's degree in Physics at the Pontifical Catholic University of Chile, recently published a research paper in the Journal of Applied Physics (AIP) that employed OOMMF (Object Oriented MicroMagnetic Framework). OOMMF, one of the many resources available on nanoHUB, is a micromagnetic package developed at NIST which allows the user to run micromagnetic simulations at the micro and nanoscale.

Vojkovic and his team's published research demonstrates how the curvature of a magnetic nanostructure can be used to induce chiral textures in the magnetization field. They have found that magnetization configurations consisting of two structures with opposite winding numbers (vortex and antivortex) appear as remanent states on the surface of a hollow toroidal nanomagnets.

"Proper control over magnetization textures is at the heart of a large variety of technological applications, including denser magnetic data storage, race-track memory devices, or nanoscale antennas. This makes any new tool to control the fate of magnetization patterns a very interesting avenue for research."

nanoHUB was utilized in the research because it provided results faster than other alternatives. Data was needed from simulation runs providing information on magnetic properties such as Remanent state, Coercivity field, Domain wall reversal, etc. However, the team faced the challenge of very long run times (approximately 6 to 8 months to run hysteresis loops simulations) because of the large magnetic nanostructure being studied (156 nm diameter).

"nanoHUB was a great alternative because it obtained the results quicker than using available computers and it eliminated the complications of correctly installing the software in some cluster."

Read more about the research [here](#).

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