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# Geometry-induced Bloch point domain wall in Permalloy conical frustum nanowires for advanced spintronics applications

Martín I. Broens <sup>1</sup>; Eduardo Saavedra <sup>2</sup>; Noelia Bajales <sup>3</sup> ; David Laroze <sup>4</sup>; Juan Escrig <sup>5</sup>

<sup>1</sup> Universidad Nacional de Córdoba. Facultad de Ciencias Químicas. Departamento de Físicoquímica; Argentina. Consejo Nacional de Investigaciones Científicas y Técnicas. Instituto de Física Enrique Gaviola; Argentina.

<sup>2</sup> Universidad de Santiago de Chile. Departamento de Física; Chile.

<sup>3</sup> Universidad Nacional de Córdoba. Facultad de Matemática, Astronomía, Física y Computación; Argentina. Consejo Nacional de Investigaciones Científicas y Técnicas. Instituto de Física Enrique Gaviola; Argentina.

<sup>4</sup> David. Universidad de Tarapacá. Instituto de Alta Investigación, Arica; Chile.

<sup>5</sup> Universidad de Santiago de Chile. Departamento de Física; Chile.

Author to whom correspondence should be addressed: [saavedra.pfm@gmail.com](mailto:saavedra.pfm@gmail.com)

## Abstract

In this study, we investigate the pseudo-static magnetic properties of Permalloy conical frustum nanowires using micromagnetic simulations. We thoroughly examine how both the major and minor radii influence the magnetic reversal mechanism when an external magnetic field is applied parallel to the nanowire axis. The obtained results show that under specific geometrical conditions, magnetization reverts through a Bloch point-type domain wall. In these cases, hysteresis curves exhibit two Barkhausen jumps during magnetization reversal, forming a plateau field range in which a Bloch point domain wall nucleates and propagates until its annihilation after the second Barkhausen jump. The nucleation of a Bloch point domain wall in a frustum conical

nanowire geometry is reported. These findings highlight the significance of this geometry in nucleating these attractive topological defects for promising applications.

Este Artículo se encuentra embargado hasta el día 30 de abril 2025

En el siguiente enlace [Supplementary materials](#)- zip file puede consultar Supplementary Material:

- I. GEOMETRIC PARAMETERS
- II. NUCLEATION AND ANNIHILATION FIELDS OF THE BLOCH POINT DW
- III. MAGNETIZATION AT ZERO FIELD
- IV. MUMAX EXAMPLE SCRIPT FOR CONICAL FRUSTUM NANOWIRES