

Thesis Defense Announcement

Mr. Ismail MADACI
will publicly defend the thesis entitled:

Epitaxial growth of thin Fe₃O₄ films on ZnO by PLD: a perspective for Spintronics

Supervised by Mr. Yves DUMONT, Ms. Olena POPOVA,
and Mr. Philippe VENNÉGUÈS

on **Wednesday, December 20, 2023 at 2:00 PM**

Location : Université de Versailles UFR des Sciences
45 avenue des États-Unis, 78035 Versailles

Room : Amphi H

Jury composition

Ms. Bénédicte WAROT-FONROSE	CNRS, CEMES - Université Toulouse
Ms. Isabelle BERBEZIER	CNRS, Université d'Aix-Marseille
Mr. Jean-Baptiste MOUSSY	CEA Saclay, Université Paris-Saclay
Ms. Nathalie VIART	Université de Strasbourg, IPCMS

Abstract

This PhD work is inscribed in the research domain of materials science for spin electronics. We aim to master the epitaxial growth of the half-metallic Fe₃O₄, a material with a fully polarized density of states, on ZnO semiconducting substrates, possessing a long spin coherence length (within the micrometer range). The successful combination “Fe₃O₄/ZnO” is the first necessary foundation for physical spin injection studies on devices. In this work notable achievements were realized, particularly the successful epitaxial growth processes for Fe₃O₄ on ZnO(000±1) substrates, regardless of substrate polarity. Precise control of oxygen partial pressure during deposition allowed the synthesis of stoichiometric Fe₃O₄ thin films, with magnetization properties closely resembling those of bulk Fe₃O₄. The investigation provided critical insights into the influence of growth temperature on the interface between Fe₃O₄ and ZnO, including the effects of intentionally grown FeO template layers. Furthermore, the research extended to explore the impact of substrate miscut on remanent magnetization of Fe₃O₄ thin films. Utilizing advanced transmission electron microscopy techniques, a comprehensive analysis of epitaxial growth revealed various structural defects, providing an in-depth understanding of the challenges in this area of research.

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