# Article information:

Enhancement of magnetic moment of Er-implanted ZnO films by post-annealing in Ar and vacuum - ScienceDirect  
<https://www.sciencedirect.com/science/article/pii/S0167577X21015986>

# Article summary:

1. Er ions were implanted into ZnO films prepared by RFMS on sapphire substrates, and the influence of annealing atmosphere on the magnetic properties of Er-doped ZnO films was investigated.

2. Strong room-temperature ferromagnetism was observed for the as-implanted and annealed films, with a considerable enhancement in magnetization observed for Er-doped ZnO annealed in vacuum.

3. The enhancement of ferromagnetism is strongly correlated with the increase of oxygen vacancies in Er-doped ZnO, and proper annealing is an effective way to enhance the concentration of Vo defects and produce a magnetic response.

# Article rating:

May be slightly imbalanced: The article presents the information in a generally reliable way, but there are minor points of consideration that could be explored further or claims that are not fully backed by appropriate evidence. Some perspectives may also be omitted, and you are encouraged to use the research topics section to explore the topic further.

# Article analysis:

The article titled "Enhancement of magnetic moment of Er-implanted ZnO films by post-annealing in Ar and vacuum" presents a study on the influence of annealing atmosphere on the magnetic properties of Er-doped ZnO films. The authors used ion implantation to introduce Er elements into ZnO films prepared by radio-frequency magnetic sputtering (RFMS) on sapphire substrates. They investigated the structural and magnetic properties of the films systematically by a combined characterization of X-ray diffractions, Raman spectroscopy, Photoluminescence, X-ray photoelectron spectroscopy, and Superconducting Quantum Interference Device.

The article provides clear evidence that the enhancement of ferromagnetism is strongly correlated with the increase of oxygen vacancies in Er-doped ZnO. The authors found that the saturation magnetization varied greatly for different annealing conditions. A considerable enhancement in magnetization is observed for Er-doped ZnO annealed in vacuum, which is accompanied by an enhancement in the concentration of oxygen vacancy. However, the Ms of the air-annealed film is less than half of the as-implanted film.

The article has several strengths, including its systematic approach to investigating the structural and magnetic properties of Er-doped ZnO films under different annealing atmospheres. The authors used various techniques to confirm their findings, including XRD, Raman spectroscopy, PL, XPS, and SQUID. Additionally, they provided clear evidence to support their claims about the correlation between ferromagnetism and oxygen vacancies.

However, there are some potential biases and limitations in this study that should be considered. Firstly, while the authors investigated different annealing atmospheres (air, Ar, vacuum), they did not explore other parameters such as temperature or time duration that could affect their results. Secondly, they did not provide a detailed discussion on how their findings compare with previous studies on RE-doped ZnO systems or TM-doped ZnO systems.

Moreover, while they discussed various defects such as VZn, Oi, Zni and Vo that are important for FM coupling in DMSs based on ZnO; however; they did not provide a comprehensive analysis on which type of defects plays a role in FM coupling specifically for RE-doped ZnO systems.

In conclusion, this article provides valuable insights into how annealing atmosphere affects ferromagnetism in Er-doped ZnO films. However; it has some limitations such as not exploring other parameters that could affect their results or providing a comprehensive analysis on which type of defects plays a role in FM coupling specifically for RE-doped ZnO systems.

# Topics for further research:

* Temperature and time duration effects on magnetic properties of RE-doped ZnO films
* Comparison of magnetic properties of RE-doped ZnO and TM-doped ZnO systems
* Role of different defects (VZn
* Oi
* Zni
* Vo) in ferromagnetism of DMSs based on ZnO
* Oxygen vacancy concentration and its effect on ferromagnetism in DMSs
* Ion implantation techniques for introducing RE elements into ZnO films
* Other post-annealing atmospheres and their effect on magnetic properties of DMSs based on ZnO

# Report location:

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