Research Grants for PhD students from the China Scholarship Council

Information Form (please read the guidelines carefully on the website www-csc.utt.fr)

Supervisor's name : el garah Given names :

Status (prof., assistant prof., …) : assistant prof

Laboratory : laboratory of mechanical & materials engineering Website address :

Institution : university of technology of troyes Website address : www.utt.fr

Scientific competence of the supervisor:

Thin films; magnetron sputering; surfaces characterization; surface treatment; oxidation

Two major publications in the field proposed for the PhD :

1. m. el garah et al. review on mechanical and functional properties of refractory highentropy alloy films by magnetron sputtering. emergent mater., 2023. https://doi.org/10.1007/s42247-023-00607-8
2. d. e. touaibia et al. oxidation resistance and mechanical properties of AlTiZrHfTa(-N) high entropy films deposited by reactive magnetron sputtering. journal of alloys and compounds, 2023, 969, 172397.

Website address of the personal page :

Supervisor's email : mohamed.el_garah@utt.fr

Description of the research work proposed for a PhD ***Topic # (see list) :*** IV-8; IV-9

Title : oxidation resistance of high entropy films by magnetron sputering

Subject :

high-temperature oxidation significantly affects many materials, resulting in high economic losses.
The development of materials resistant to high-temperature oxidation can therefore improve component performance and lifetime. In this context, the development of high-entropy thin-film alloys with superior properties is of a great interest and should be pursued in many applications, especially for applications in the field of low-carbon energy.

This project aims to develop innovative films capable of resisting oxidation in harsh environments. We have begun work focusing on how to improve the oxidation resistance of high-entropy refractory alloys at high temperatures (800°C). Encouraging results show that it is possible to attenuate oxygen diffusion in this type of material. Nevertheless, the oxidation mechanism needs to be studied in depth to gain a better understanding of the phenomenon and propose a solution with improved resistance (T > 1100°C). Oxidation measurements will be carried out at LASMIS, Nogent Antenna, using Thermogravimetric Analysis (TGA) under atmospheric conditions.

More details are in attached pdf.

Keywords :

pvd, oxidation, high entropy thin films, refractory films

Expected collaborations :

Institut Jean Lamour at Nancy, Lorraine University, France

Background required from the applicant :

Master's degree in materials science.
- Ability to work independently, to plan and execute tasks and to work in a group.
- Good communication skills in English and/or French, both written and oral.
- Good understanding of oxidation phenomena in metal alloys.

Existence of a PDF file detailing the proposal ("yes" or "no") : yes

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