



FACULDADE DE
CIÊNCIAS E TECNOLOGIA
UNIVERSIDADE DE
COIMBRA



Centre for Mechanical Engineering, Materials and Processes

CEMMPRE

PROPOSTA DE PLANO DE DOUTORAMENTO/DOCTORAL PLAN PROPOSAL

(a ser redigido em Inglês / to be filled in English)

ORIENTADOR(A)/SUPERVISOR: Fábio Emanuel de Sousa Ferreira

GRUPO/GROUP: Materials and Processes

ORIENTADOR(A)/SUPERVISOR: Luís Miguel Cardoso Vilhena Pereira da Silva

GRUPO/GROUP: Mechanical and Intelligent Manufacturing

LOCAL DE REALIZAÇÃO DO TRABALHO/PLACE OF WORK: Mechanical Engineering Department of the University of Coimbra

TÍTULO DO PLANO DE DOUTORAMENTO/TITLE OF THE DOCTORAL PLAN: Sustainable Lubricating Interfaces towards a more energy-efficient Maritime Transportation

RESUMO/SUMMARY (max. 300 words total)

Objetivo/Objectives: Ships are the largest carries of world freight and people. The annual energy use per ship is staggering (~120000 GJ). Continued prosperity and economic growth of developed countries requires securing the sustainability of our energy use. A cornerstone in achieving this is the improvement of energy efficiency. Since 30% of the energy currently used by ships is employed to overcome friction, the development of engineering solutions that can improve energy efficiency of maritime transportation vehicles is timely. Improved friction and wear management approaches could also lead to drastic reductions in greenhouse gas emissions and release of contaminants in sea waters. The latter is an increasingly urgent challenge that requires timely actions to be taken to positively shape our ecosystem in the decades to come.

This doctoral plan aims to develop the knowledge necessary to rationally design green lubricating solutions based on the combined use of a wear-resistant surface coating, namely diamond-like carbon (DLC), and a novel class of lubricants, namely biocompatible ionic liquids (ILs). Through the evaluation of

the phenomena occurring at sliding interfaces, the doctoral plan will provide guidance for the design of DLC films and ILs with task-specific tribological performance.

Resultados Esperados/Expected Results: The doctoral plan outcomes will enable the development of technological solutions able to satisfy the strict legislations related to environmental gas emissions in maritime transportation, while enabling the reliable and long-term functioning of heavily loaded mechanical components used in ships, such as fluid-power hydraulics machinery, etc. The Existing UN, EU and national emission regulations are already affecting the performance of some modern machinery, and as these restrictions become tighter, several lubricants with regulated additives will have to be abandoned.

Programa Doutoral/Doctoral Program	Ordenação por ordem de preferência/Sorting in order of preference
Engenharia Mecânica/Mechanical Engineering	1
Engenharia Química/Chemical Engineering	2
Engenharia Biomédica/Biomedical Engineering	3
Biociências/Biosciences	4