Secteur des Sciences
et Technologies

Invitation à la soutenance publique de thèse de

Monsieur Alvise MIOTTI BETTANINI

Master of Science in Material Science and Engineering

Pour l'obtention du grade de Docteur en sciences de l'ingénieur et technologie

«On the process, structure, property relationship for the optimization of strength and bendability of martensitic stainless steels »

qui se déroulera
**le vendredi 26 avril 2019 à 16h15**
**Auditoire BARB 93**
**Place Sainte Barbe, 1**
**1348 Louvain-la-Neuve**

Membres du jury :

Prof. Laurent Delannay (UCLouvain), supervisor
Prof. Pascal Jacques (UCLouvain), supervisor
Prof. Sandra Soares Frazao (UCLouvain), chairperson
Prof. Thomas Pardoen (UCLouvain), secretary
Prof. Anne-Françoise Gourgues-Lorenzon (MINES ParisTech, France)
Prof. Nele Moelans (KULeuven, Belgique)
Prof. Dirk Mohr (ETH, Zurich, Suisse)
PhD Jean-Denis Mithieux (APERAM, France)

Progress in the structural engineering of materials for automotive is essential to ensure safe and sustainable means of transportation. This thesis presents the property - structure - process relationship of a novel niobium-added high strength martensitic stainless steel aiming to enhance its crash performance. Despite the large extent of research efforts on high strength steels, there is today an urgent need to reduce the development cycle of materials through the application of design tools that enable the rapid identification of pathways for materials optimization.

In this work, a multi-scale approach combining mechanical characterizations at the macroscale with finite elements simulations at the microscale allows the *translation* of the target properties into suitable microstructures. This first effort identifies critical microstructure features that undermine the overall mechanical properties. Above all, residual islands of ferrite phase and undissolved chromium carbides, common sub-products of steel processing, were found detrimental to ensure good bendability of the steel sheets.

In the second part of this work, the microstructure is optimized with *creator* tools such as the CALPHAD method which, through the understanding of the diffusion mechanisms at the atom-scale, contributes to the development of novel microstructures with increased mechanical properties.