Project report 2020

DECCOBABA

DEvelopment and Characterization of New CO BAsed alloys for Biomedical Applications

MAIN PARTICIPANTS

			
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OVERVIEW *(keep within this page)*

Starting year: 2014 **Current researchers** (permanent/non-permanent): 3 person-month/year

Positioning *(Multiple selection allowed – total 100%)*	**Transportation**	**Energy**	**Eng. for Health**
Materials and structure design			100%
Surfaces and interfaces			
Simulation and modeling			

Other:

Include partner from ☐ Outside ELyT ☐ Industry

Main funding source(s)
☒ Public project(s) ☐ Industrial ☒ Own resources

IFS CRP/LyC project? ☐ Yes ☐ No

For main projects: Agency / year / name of project *(up to 3, past projects in gray)*

Estimated annual budget: 12000 euros

Highlights & Outstanding achievements *(3-5 bullet points)*

- A 4 months stay in France for a Japanese master student
- A new paper published

Illustration *(5x5 cm² max)*

PROJECT DESCRIPTION

Background (10 lines max; Calibri 11)

Co based alloys are already widely used for various biomedical applications. Moreover, more and more parts are made through additive manufacturing techniques. Thus, there is now some efforts to make to develop new alloys permitting to obtain optimized microstructure and mechanical properties at the end of the elaboration process for being used in biomedical applications.
Thus, this project will address that topic. Some thermodynamic calculations will be carried out to predict the equilibrium phases. Bulk materials will be casted and some additive manufacturing experiments (when the powder can be elaborated) will be realized varying the different process parameters. Microstructural characterization as well as mechanical ones will be done to evaluate the in-use properties of the new alloys. Damage characterization and biocompatibility will be assessed to have a complete picture of the potentiality of these new designed alloys.

Key scientific question (2 lines max; Calibri 11)

Optimization of the alloys for biomedical applications
Interest of the additive manufacturing

Research method (8 lines max; Calibri 11)

The objectives of COMIC encompass material science, tribology and electrical physics. The material is obtained from commercial ink, with incorporation of graphene nano objects made electrically non-neutral through triboelectric process. The inclusion of the particles in the ink matrix is obtained through solution casting method with ultrasonic dispersion. A particular attention is paid to the charged ink and paper interface to ensure that bonding properties are kept while maintaining a viscosity level sufficient for graphene particle movements. Finally, dielectric analysis is performed to evaluate the polarizability and electromechanical coupling of the embedded nano particles.

Research students involved *(gray color for previous years)*

Ph.D. candidates (years, institution):

Master/Bachelor students (years):

- A. Numata : October 2019 – March 2020 (4 months)
- S. Aota : February-August 2018 (6 months)

Visits and stays *(gray color for previous years)*

FR to JP (date, duration):

JP to FR (date, duration):

- A. Numata : October 2019 – March 2020 (4 months)

COMMUNICATIONS AND VALORIZATION

Journal publications *(gray color for previous years)*

	Authors	Title	Journal	Vol.	pp. / ID	Year	DOI
1	Kenta Yamanaka, Manami Mori, Kazuo Yoshida, Sandra Balvay, Daniel Hartmann, Damien Fabrègue, Akihiko Chiba	Preparation of high-strength Co– Cr–Mo alloy rods via hot-caliber rolling	Materialia	12	100729	2020	https://doi.org/10.1016/j.mtla.2020.100729

Conferences *(gray color for previous years)*

	Authors	Title	Conference	Date	City	Country	DOI *(if applicable)*

Patents *(gray color for previous years)*

	Inventors	Title	PCT #	Year

Others *(gray color for previous years)*

	People	Event	Description	Date
1				
2				