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### Design of multi-major-component (high entropy) alloys of suitable magnetic and mechanical properties based on a Hume-Rothery approach

Multi major component alloys (also called high entropy alloys (HEAs)) appeared around 2004. They are based on 4 or more elements in close to equimolar composition. The equal footing of each element on solidification leads to an interesting new metallurgy providing materials with promising properties. The design of HEAs is thus a challenge to improve traditional compositions with possibly cheaper or greener components. The present work reports a strategy for the design of HEAs with suitable magnetic and mechanical properties based on a Hume-Rothery approach, namely on the calculation of the number of itinerant valence electrons and the average atomic radius for 12 atoms neighborhood. Prediction algorithms based on self-ordering maps permit to improve the composition choice.

#### Recent Publications

1. Calvo Dahlborg M and Brown S G R (2017) Hume-Rothery for HEA classification and self-organizing map for phases and properties prediction. *J. Alloys and Compds* 724:353-364.
2. Calvo Dahlborg M, Cornide J, Tobola J, Nguyen-Manh D, Wrobel J S, Juraszek J, Jouen S and Dahlborg U (2017) Interplay of electronic, structural and magnetic properties as driving feature of high entropy *J. Phys. D: Applied Phys.* 50:185002.
3. Dahlborg U, Calvo Dahlborg M, Eskin E and Popel P S (2018) Chapter 8. Thermal melt processing of metallic alloys in "Solidification Processing of Metallic Alloys under External Fields". Ed. Mi J and Eskin D G, Springer Int Publ. Ed. ISBN 978-3-319-94842-3.
4. Dahlborg U, Cornide J, Calvo-Dahlborg M, Hansen T, Fitch A, Leong Z, Chambreland S and Goodall R (2017) Structure of some CoCrFeNi and CoCrFeNiPdx multicomponent HEA alloys by diffraction techniques. *J. Alloys and Compounds* 681:330-341.
5. Bogno A A, Dahlborg U, Calvo-Dahlborg M, Riveros C, Ciftci N, Henein H and Sediako D (2016) Characterization of a  $\{(Fe_{60}Co_{40})_{75}B_{20}Si_5\}_{96}Nb_4$  impulse atomized glassy powder by neutron diffraction and differential scanning calorimetry. *J. Non-Crystalline Solids* 432:466-470.

#### Biography

Monique Calvo Dahlborg completed her PhD in the year 1985 from Caen University, France. She is CNRS Senior Scientist at University of Rouen Normandy (France) and Honorary Research Fellow of Swansea University (UK). She has published more than 40 papers in reputed journals and more than 45 in proceedings with reviewing procedure. She has expertise in rapid solidification, disordered metallic systems and high entropy alloys and has contributed to many international research projects.

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