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We introduce a new model for calculating the change in time of three-dimensional atomic configurations. The method is based on the kinetic mean field (KMF) approach, however we have transformed that model into a stochastic approach by introducing dynamic Langevin noise. The result is a stochastic kinetic mean field model (SKMF) which produces results similar to lattice kinetic Monte Carlo (KMC). SKMF is, however, far more cost-effective and easier to implement the algorithm (we also made an open source program code available). [1]

[1] Zoltán Erdélyi, Mykola Pasichnyy, Volodymyr Bezpalchuk, János J. Tomán, Bence Gajdics, Andriy M. Gusak, Stochastic kinetic mean field model, Computer Physics Communications, Available online 6 April 2016, ISSN 0010-4655, http://dx.doi.org/10.1016/j.cpc.2016.03.003

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Evaluation of Metallurgical and Mechanical Properties of Dissimilar Metals Welds between Duplex Stainless Steel and HSLA Steel

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Dissimilar material joining is generally more challenging than that of similar materials, due to various factors such as the differences in chemical compositions and the physical and mechanical properties of the base metals welded

In this study, the metallurgical characteristics, and mechanical properties of dissimilar metals welds between duplex stainless and Low alloy steel have been evaluated. Duplex E2209 and Austenitic E309L filler metals were used to join this combination using multipass gas tungsten arc welding process.

The microstructure investigation was conducted with optical microscope, scanning electron microscope, Energy dispersive scanning and X-ray diffraction.

EDS line scanning performed across the interface low alloy steel/weld metals reveals a variation of alloying elements (Cr, Ni, Mo) across this interface.

A higher value of hardness is recorded in a narrow zone between the fusion boundary and type II boundary, which is attributed to the presence of harder phases in this region, due to the migration of carbon from the HSLA side to the weld metal. Both of welds gave acceptable values of tensile strength and impact toughness

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Microstructure and Properties of Composite WC-8(Co, Ni): Effect of the Addition of SiC

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The WC-based cemented carbides, also called hard metals, are a family of composite materials consisting of carbide ceramic particles embedded in a metallic binder. They are classified as metal matrix composites (MMCs) because the metallic binder is the matrix that holds the bulk material together [1]. WC based composites are used in applications where a good combination of hardness and toughness are necessary [2]. It is usual to add more components as the tungsten carbide in a binder (Co, Ni) to build the microstructure. The hardness for the cemented carbides based on nickel, because of the addition of reinforcements SiC nano-whisker increases significantly [3]. In this work, the SiC was researched as an additional component for composite WC-8(Co, Ni). Four mixtures were prepared with SiC content ranging from 0 to 3.0 wt%. These mixtures were pressed (200 MPa) and green samples with 25.2 mm of diameter and 40g were produced. Sintered were carried out in Sinter-HIP furnace (20 bar). Two sintering cycles were investigated with 1380 and 1420°C, and the sintering time considered was 60 minutes. The relative density, hardness, linear and volumetric shrinkage were determined. Microstructural evaluation was performed by optical microscopy and scanning electron microscopy (SEM-FEG). The results showed that the addition of SiC promoted higher densification and grain growth. The hardness was higher for samples with SiC, so solid solution hardening of the binder was more effective than WC grain growth.

[1] M.P. Groover. Principles of Modern Manufacturing, 5th ed. John Wiley & Sons, New York, 2013.
[2] K.J.A, Brookes. World Directory and Handbook of Hardmetals and Hard Materials, 6th ed. 1996.
[3] R. Xiaoyong. P. Zhijian, P. Ying, F. Zhiqiang, W. Chengbiao, Q. Longhao, M. Hezhuo. Int. Journal of Refractory Metals and Hard Materials 36 (2013) 294–299