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Molybdenum, and essential element in tool steels

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Tool steels are the alloys used to manufacture tools, dies, and molds that shape, form, and cut other materials such as steels, nonferrous metals, and plastics at either ordinary or elevated temperatures. They are either carbon, alloy or high-speed steels, capable of being hardened and tempered.

The high carbon and alloy contents of tool steels are used to produce very high strength and hardness by the formation of crystalline phases such as martensite and various alloy carbides. Later show a very high hardness and are, therefore, mainly responsible for an excellent wear resistance. The phases are arranged into microstructures by solidification or powder processing, hot rolling, and heat treatment. Many variations of this microstructure exist, depending on alloying and processing condition, and this plays a role in the performance of a steel under specific service conditions. However, major alloying elements in tool steels belong to the group of transition metals such as molybdenum, tungsten, and vanadium, as carbides formed by transition metals have strong interatomic bonding, high melting points, and unique electrical properties. In this presentation an overview on the influence of Mo on this arrangement of phases and as a result the properties in various tool steel systems is given.

Speaker Country

Austria

Primary author: LEITNER, Harald (voestalpine BÖHLER Edelstahl , Senior Research Scientist)

Presenter: LEITNER, Harald (voestalpine BÖHLER Edelstahl , Senior Research Scientist)

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