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## The influence of chromium and molybdenum elements on the microstructure of the high manganese steel grade.

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Manganese steel is a high-carbon alloy known for its exceptional toughness, ductility, and wear resistance. A high manganese grades comprising approximately 22-44% manganese and 1% carbon, exhibits remarkable work-hardening properties, making it ideal for high-impact applications. While the metal grade specification does not indicate any chromium and molybdenum elements, these were found in some melts due to the scrap material used. When in moderate concentrations not to cause significant carbide formation, they influenced the material microstructure, with sub-grains formed within some grains. These carbide formers were also found to be associated with smaller grain structure, which improves the mechanical properties of the material according the Hall-Petch equation. This unique microstructure of manganese steel contributes to its ability to withstand heavy stress and abrasive conditions, commonly found in mining, construction, and rail industries.

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