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# On the microstructure control of the bendability of advanced high strength steels

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## Abstract

The formability of newly developed steel grades is a key parameter for their successful implementation in the car body. In the present work, the influence of the microstructure on formability during air bending is studied. First- and third-generation advanced high strength steels with tensile strengths above 1000 MPa are investigated, which exhibit a broad range of microstructural constituents (ferritic bainite, bainite, martensite, and retained austenite). Interrupted bending experiments are performed on two grades of dual phase and complex phase steels, respectively, in order to reveal the microscopic deformation and failure processes. The formability in hole expansion tests is determined and used as a measure for the resistance of the materials against crack formation. The macroscopic deformation behavior of the materials is taken into account by measuring the differential strain hardening exponent and performing finite element simulations of the air bending process. Advantages and disadvantages of various microstructural features are worked out, and it is explained why the first-generation dual phase steel exhibits the lowest and the third-generation complex phase steel the best formability during air bending.

## Keywords

Dual phase steel, complex phase steel, microstructure, bending, shear band formation, crack initiation

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