Abstract

In the following paper, the developments in Advanced High Strength Steels (AHSS) that are used in automotive industry are summarized. AHSS show good formability while maintaining high strength values. These properties can be achieved via grain refining, mixed ferritic microstructures and by leveraging phenomena such as Transformation Induced Plasticity and Twinning Induced Plasticity (TWIP). However, time and energy consuming thermal processes as well as expensive alloying additions should be employed in order to achieve these properties. The new era of AHSS requires combinations of greater strength – ductility via ultra-grain – refined ferrite, martensite, bainite and austenite at a cost significantly less than the previous grades. It is envisaged that microstructural evolution under the effect of ultra-fast heating and the subsequent quenching or air cooling may result to a new outlook for alloy design. The key aspect in this technological possibility is the effect of chemical heterogeneity in the initial microstructure. The inhomogeneous microstructure remains unchanged due to the rapid reheating as a result of the restriction of the time available for solid state diffusion. A promising example of such technology is the single-stepped reheating of steel which, although unconventional, has been observed to lead to complex microstructures of chemical heterogeneity.