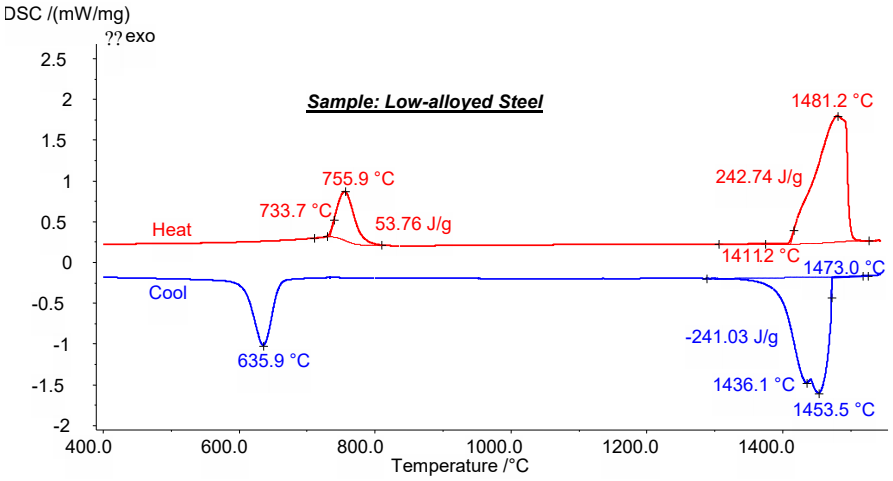
APPLICATION**SHEET**

Metals/Alloys · Automotive
DSC 404 *Pegasus*®

Low-Alloyed Steel

Introduction

Steel is a metal alloy the major component if which is iron, with carbon being the primary alloying material. Carbon acts as a hardening agent, preventing iron atoms, which are naturally arranged in a crystal lattice, from sliding past one another dislocation). Varying the amount of carbon and the content of other possible additives (alloy components) will have a strong influence on the phase change behavior. When iron is molten from its ore by commercial processes, it contains more carbon than desirable. To become steel, it must be melted and reprocessed to remove the correct amount of carbon, at which point other elements can be added. High-temperature differential scanning calorimetry can provide helpful information if these processes ended up to the desired product quality.



Test Conditions

Temperature range:	RT ... 1550°C
Heataing/cooling rates:	20 K/min
Atmosphere:	Argon at 50 ml/min
Sample mass:	173.24 mg
Crucible:	Pt with liner and lid
Sensor:	DSC type S

Test Results

Presented in the plot is the measured specific heat flow rate of a low-alloyed steel between 400 and 1550°C. At 734°C, the change in the crystal structure (from body center to face centered) can be seen. However, it must be pointed out that in the same temperature range, a change in the magnetic properties (ferromagnetic to paramagnetic) occurred. Melting of the material was measured at 1411°C (solidus temperature). The heat of fusion was 242.7 J/g. The liquidus temperature was found during cooling (onset of solidification). This was measured at 1473°C. The heat of solidification (-241.0 J/g) is nearly the same as the heat of fusion. The double-step character of the melting/solidification process can be seen more clearly during the cooling run. The solid-solid transition at lower temperatures is also visible during cooling. However, it is shifted to lower temperatures (undercooling).

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