"training". It has been found that the texture is not markedly affected by rolling conditions, and texture is therefore not a major factor in explaining variations in SME with processing conditions. Decreasing the pre-deformation temperature to below the M_s was found to have a beneficial effect on shape memory. It was found that the best SME was achieved in an alloy that had M_s just above room temperature, and had been processed by hot rolling followed by recovery annealing. Alloys of different compositions exhibited different optimum rolling temperatures for maximum shape memory performance.

(cf. *ISIJ Int.*, **46** (2006), 1703)

Influence of heat treatment on formation behavior of boron nitride inclusions in P122 heat resistant steel

K.SAKURAYA et al.

To clarify the behavior of the formation of boron nitrides in P122 heat resistant steel containing 0.003 mass% B and 0.06 mass% N, the influence of heat treatments, remelting and hot working were investigated by SEM observations on boron nitrides at the fractured surfaces of the steel samples and by the EDS analysis.

Boron nitrides start to precipitate at temperatures between 1 150 and 1 200°C during the cooling process after hot forging or rolling. They agglomerate to a very large size of about 20 to 30 μm at a very slow cooling rate of 100°C/h. However, they only grow to 1 to 3 μm at a medium slow cooling rate and never precipitate at a very fast cooling rate such as in water quenching. The precipitation behavior of boron nitrides has also been found to be affected by the cooling rate after normalizing but not by the microstructure of the steel resulting from casting or forging.

(cf. *ISIJ Int.*, **46** (2006), 1712)

Mechanical Properties

Wear reduction of carbide tools observed in cutting Ca-added steels for machine structural use

N.MATSUI et al.

The effect of Ca addition for improving machinability in carbide tool machining operation has been widely known. It has been proposed that oxide inclusions, which would work as "belag" on the tool surface during machining operation, has been responsible for this effect. In recent years, when Ca-treated steels containing higher sulfur are machined, MnS has been observed to form on the rake face, and this "inclusion layer," instead of the oxide belag, would serve favorably for machinability.

In this paper, we have investigated the influence of several inclusions and the addition of Ca and/or Mg on rake face wear of carbide tools. The rake face wear of Ca-added steel was appreciably reduced due to the MnS inclusion layer formed on the rake face. However, the concurrent addition of Ca and Mg to the steel did not improve the rake face wear. Combined with a TEM observation in a cross section of MnS layer formed on the rake face, these results are understood by the different nature of oxide inclusions in terms of abrasive wear.

(cf. *ISIJ Int.*, **46** (2006), 1720)