KAWASAKI STEEL TECHNICAL REPORT
No.24 (April 1991)

Development of Extra-deep Drawing Cold-Rolled Sheet Steels for Integrated Automotive Parts

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Synopsis :

To develop extra-deep drawing (EDDQ) cold-rolled sheet steels for integrated automobile parts, effects of steel chemistry and processing conditions on the mechanical properties of extra-low C steels have been investigated. Strong carbide-forming elements such as Ti and Nb are necessary to stabilize C even in 20 ppm C steels. Ti-bearing steel has superior ductility and drawability to Nb-bearing steel since grain growth at recrystallization is faster in Ti-added steel than in Nb-added steel due to the difference in the precipitate dispersion. A small amount of Nb addition to Ti-stabilized steel is effective in decreasing the planar anisotropy of mechanical properties. High temperature continuous annealing (850-880) and low reduction temper-rolling (about 0.5%) with the use of the Ti and Nb co-addition steels have provided new products with an excellent mechanical property superior to the mechanical property of conventional EDDQ steel. These products have been used for complicated and enlarged automobile parts such as a side outer panel and an oil pan.

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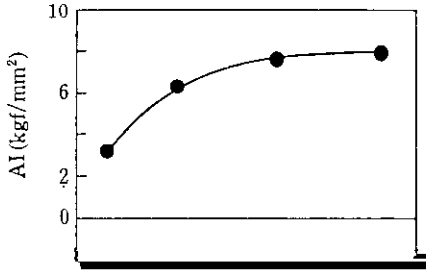
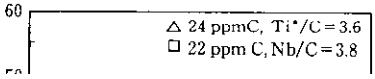


Table 1 Chemical compositions of steels used

Steel*1	C (ppm)	Ti (wt.%)	Ti*(at.%) / C (at.%)	Nb (wt.%)	Nb (at.%) / C (at.%)
F	32	—	—	—	—
T	24	0.045	3.6	—	—
N	22	—	—	0.065	3.8
TN1	20	0.020	2.4	0.004	

examined in the three directions; 0°(L), 45°(D) and 90°(T) with respect to the rolling direction. The average

aging property with Al less than 1 kgf/mm^2 since they contained enough amount of alloying elements to the



temperature associated with the increase of solute Ti and solute Nb was recognized in other work.[8] Conse-

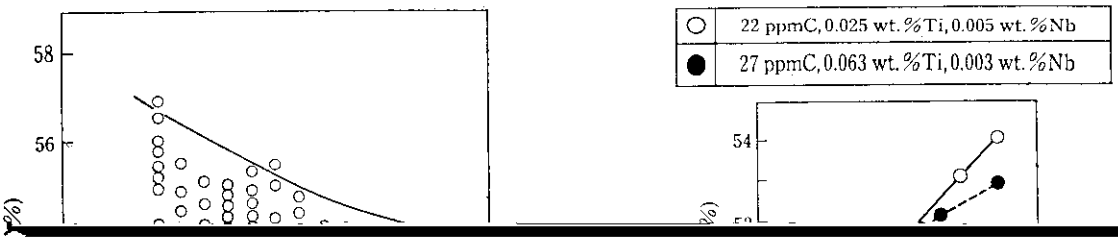

○ 22 ppmC, 0.025 wt.%Ti, 0.005 wt.%Nb
● 27 ppmC, 0.063 wt.%Ti, 0.003 wt.%Nb
58
56
54
%)

Table 3 Manufacturing conditions and mechanical