Therefore, the heat-treatment results have indicated the following features of Ni–22 Cr and Ni–30 Cr prior to shock deformation :

(1) There is an anomalous increase in resistivity with temperature.

(2) There is an equilibrium domain size with LRO within the domains.

(3) Ordering occurs through the establishment of antiphase domains with an equilibrium concentration of vacancies within the domains.

(4) The processes attributed to (1) and (2) operate in parallel with different temperature responses.

3.2. *Shock Deformation Experiments*

Specimens of Ni–22 Cr and Ni–30 Cr were shock loaded after three types of initial heat treatments :

(*a*) water quench from 1250°c ;

(*b*) furnace cool from 1250°c ; and

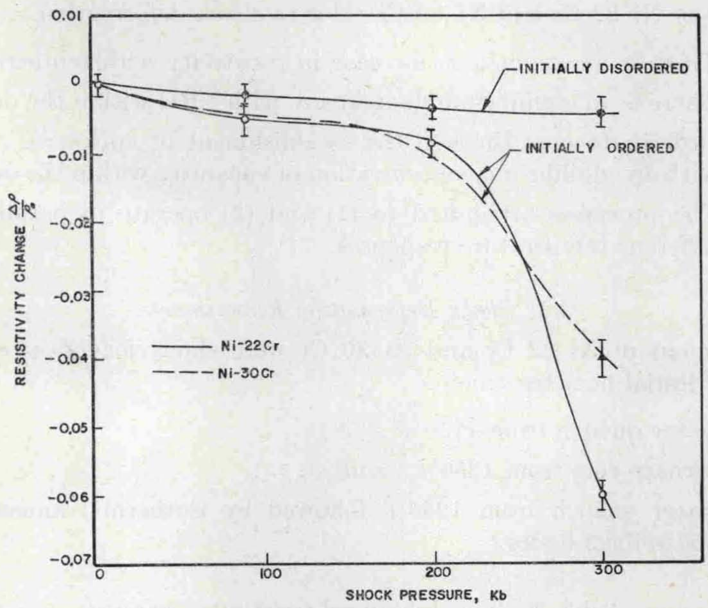
(*c*) water quench from 1250°c followed by isothermal annealing at 350°c for 3 hours.

Table 2. Shock induced resistivity changes

Alloy	Heat treatment	Shock pressure (kbar)	$\Delta\rho/\rho_0$
Ni–22 Cr	Furnace cool (FC) 1250°c	90	−0·0050
	FC, 1250°c	200	−0·0080
	FC, 1250°c	300	−0·0600
Ni–30 Cr	FC, 1250°c	90	−0·0040
	FC, 1250°c	200	−0·0090
	FC, 1250°c	300	−0·0421
Ni–22 Cr	Quenched (Q), 1250°c	90	−0·0001
	Q, 1250°c	200	−0·0003
	Q, 1250°c	300	−0·0004
Ni–30 Cr	Q, 1250°c	300	−0·0003
Ni–22 Cr	Q, 1250°c ; A, 350°c	90	−0·0048
	Q, 1250°c ; A, 350°c	200	−0·0063
	Q, 1250°c ; A, 350°c	300	−0·0530
Ni–30 Cr	Q, 1250°c ; A, 350°c	90	−0·0070
	Q, 1250°c ; A, 350°c	200	−0·0075
	Q, 1250°c ; A, 350°c	300	−0·0350

Table 2 and fig. 6 summarize the shock-induced changes in electrical resistivity of Ni–22 Cr and Ni–30 Cr. It is noted that shock loading at 300 kbar generally destroys the ordered state for (1) the furnace cooled specimens and (2) the quenched and re-annealed specimens. The resistivity of the disordered (quenched) alloys was found to decrease continuously with shock pressure. This change in resistivity is surprising since the

Fig. 6



Effect of shock pressure on the resistivity of Ni–22 Cr and Ni–30 Cr.

shock deformation of a random solid solution is expected to increase the resistivity by producing a high density of point defects. The decrease in resistivity may be an indication that the quench had not completely destroyed K-state.

Figure 7 shows the effect of isothermal annealing on Ni–22 Cr furnace cooled specimens, shock loaded at 300 kbar. In the temperature range of 300°–400°C, within which the K-state is intensively formed (Nordheim and Grant 1953), the resistivity of the furnance cooled-shock loaded specimens attained their pre-shock value. The increase in resistivity during annealing, which is highly irregular for other alloys is further evidence that some type of order occurred. As shown in fig. 7, a similar effect was observed for the Ni–30 Cr alloy. It is apparent that the principal effect of shock deformation on furnance cooled Ni–22 Cr and Ni–30 Cr alloys is not so much in the accumulation of shock induced defects as in the the transition from an ordered to a random solid solution. The subsequent annealing of the furnace cooled, shock loaded specimens forms a state of order which may be similar to K-state.

Isothermal annealing of the quenched-shock loaded specimens resulted in the recovery of K-state and shock induced point defects. This result is expected since the effect of shock deformation of a random solid solution is the accumulation of point defects and dislocations. In the temperature range of 400°–500°C the resistivity of the quenched-shock loaded specimens approached the resistivity of K-state. Shock deformation does not inhibit the formation of K-state in Ni–Cr alloys.