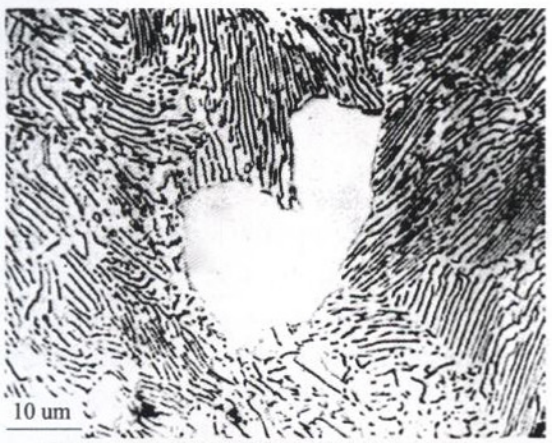
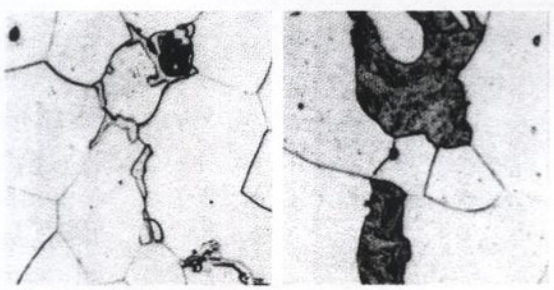
The carbon distribution is uneven in the growing austenite. Factors such as temperature, material composition and grain size of parent phases, have great effects on this process (Brooks, 1992; Thelning, 1984; Leblond and Devaux, 1984; larsson and Karlsson, 1975; Jacot and Rappaz, 1997; Jacot and Rappaz, 1999; Jacot *et al.*, 1998; Karlsson and larsson, 1975).



a) Austenite nucleated from grain boundaries of pearlite matrix.



b) Austenite nucleated from grain boundaries of ferrite matrix.

Fig. 3. Nucleation of austenite at grain interfaces of parent phase. a) Austenite nucleated from grain boundaries of pearlite matrix; b) Austenite nucleated from grain boundaries of ferrite matrix, and the right micrograph represents a later stage of austenitization compared with the left one.

2. 3. *Homogenization of austenite*

Homogenization of austenite includes the processes of dissolution of retained cementite and chemical homogenization. Behind the moving interface of austenite-parent phases, austenite may contain undissolved carbide in the form of spheroidized articles (Roberts and Mehl, 1943; Samuels, 1980; Bain and Grossman, 1964), (Fig .5)termed as retained cementite. Immediately after the

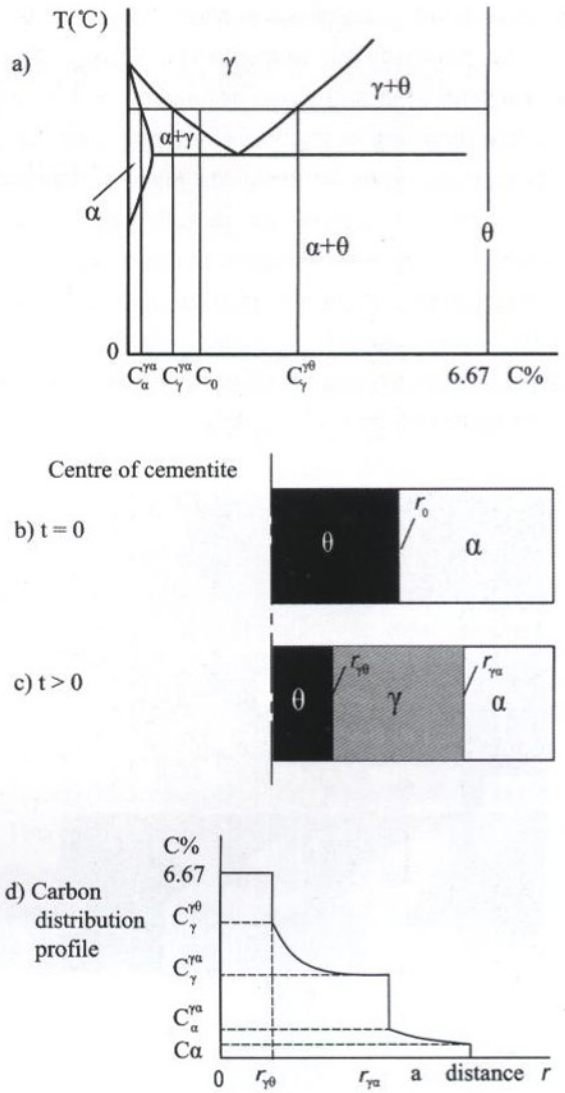


Fig. 4. Austenite grain growth between θ and α phases. a) Equilibrium diagram, b) original state of the θ - α, c) γ growth and d) carbon distribution profile.

parent phase disappears and the steel is fully transformed into austenite, chemical composition is still nonuniform. The development of the austenite grain size and carbon concentration profile during a whole austenitization process is illustrated in Figure 6, for a low carbon steel whose average carbon content is C_0, Fig. 4 a). Stage Ⅰ represents the initial state of parent phases composed of cementite and ferrite; Stage Ⅱ represents the growth of austenite, Stage Ⅲ represents the homogenization process and Stage Ⅳ is the final homogenized austenite. The corresponding carbon distribution profile is shown in Figure 6 b). A significant carbon concentration gradient exists in the austenite region shown in Figure 6 b). Curve Ⅲ,