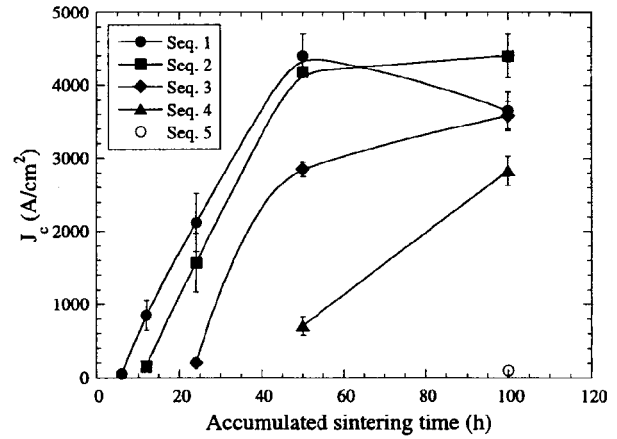


**Figure 5.** Evolution of Bi-2223 phase with sintering time for PIT tapes from experimental set B.

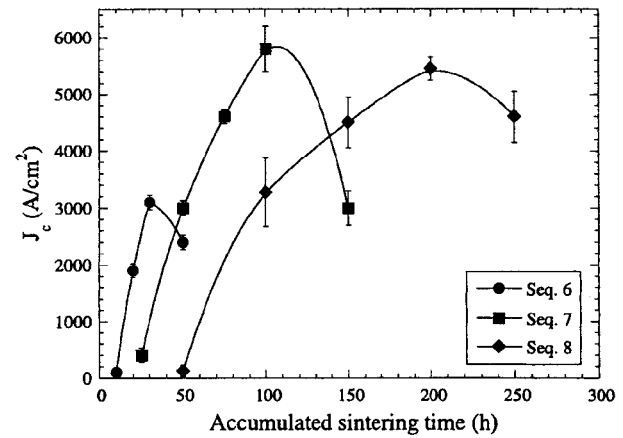
### 3.2. Critical current density

The  $J_c$  values of the five sequences of samples examined in experiments of set A are shown in figure 6, where the error bars represent the degree of scattering. In the case of samples that have been heat treated for 100 h without pressing (sequence 5), the  $J_c$  value remains very low. Similarly, the  $J_c$  values of PIT tapes that have received only one pressing between two 50 h sintering cycles (sequence 4) remain low. On the other hand, for the remaining sequences (sequences 1–3),  $J_c$  is found to increase as the thermomechanical treatment proceeds and then either levels off or decreases after a certain number of steps. In addition,  $J_c$  improves with the number of mechanical pressings for a given amount of accumulated sintering time. An exception to this behaviour is in sequence 1 where  $J_c$  reaches a maximum value after 50 h and begins to decrease on further treatment. It should be noted that the errors involved due to reproducibility range from 2% to 9%. Hence, the drop in  $J_c$  in sequence 1 is not much larger than these limits. Nevertheless, it can be concluded that, for sequence 1,  $J_c$  is not improved by further thermomechanical treatment after 50 h of accumulated sintering time. Results obtained from sequences 2 and 3, however, show a promising behaviour where  $J_c$  increases monotonically with thermomechanical treatment. It is also worth mentioning that the rapid improvement in  $J_c$  of the set A samples (<60 h in sequences 1–3) coincides with the increase in Bi-2223 fraction as shown in figure 4. As the Bi-2223 formation is slowed after 60 h of heat treatment, the rate of  $J_c$  improvement is also reduced.

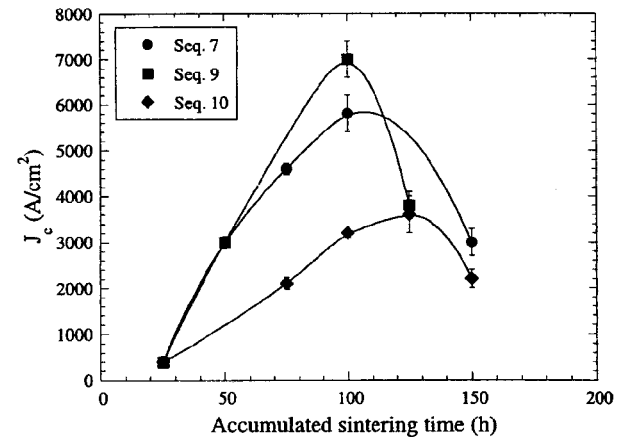
Figure 7 shows  $J_c$  as a function of accumulated sintering time for the second set (set B) of PIT tapes. Similarly to the results of set A,  $J_c$  of these samples initially increases rapidly, reaches a maximum value when the Bi-2223 conversion is about 95% (figure 5), and then decreases on further pressing. Taking into consideration the need to minimize the total processing time, a sintering duration of 25 h between mechanical pressing steps (sequence 7) appears to give the best  $J_c$  performance. In the case of the 10 h sintering duration (sequence 6), the  $J_c$  values are low



**Figure 6.** Variation in  $J_c$  with accumulated sintering time for PIT tapes from experimental set A.



**Figure 7.** Variation in  $J_c$  with accumulated sintering time for PIT tapes from experimental set B.



**Figure 8.** Variation in  $J_c$  with accumulated sintering time for PIT tapes from experimental set C. Also included for comparison are  $J_c$  values of sequence 7.

and reach a maximum value well before the 100 h range. On the other hand, samples with 50 h sintering duration achieve a maximum  $J_c$  comparable with that of sequence 7, but it takes twice as long to do so. Accordingly, a long