without plastic deformation, there are always two phases present ferrite and pearlite with different rates and different grain orientation between the two samples (e.g., Fig. 10b and 11c).

In general, the most critical zone is the plastically deformed zone in which the hardness increases considerably, which causes a reduction in ductility. For this, heat treatments after welding are necessary to improve the characteristics and microstructures of the weld.

5. CONCLUSION

This work concerns the rotary friction welding of two parts with high carbon steel chromium alloyed (100Cr 6). Its main aim is to investigate the effect of the geometry of the section to be welded on the properties of the weld joint obtained in order to evaluate the weldability of this steel which has poor fusion weldability.

This study showed that this steel was successfully welded by friction. A change in microstructure between the center zone and the edge zone was observed. A difference in the extent of the weld joint, ie, when the interface is convex, the plastically deformed zone is wider, resulting in greater axial shortening. It can thus be concluded that the geometry of the welded surface has an effect on the resulting metallurgical characteristic of the weld. It is therefore important to evaluate this parameter carefully to ensure the desired penetration while maintaining good metallurgical characteristics.

In general, friction welding generates a very hard weld joint. The critical location corresponds to the peak of hardness at the deformed zone. This can result in fragile fracture.

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