牙科用鑄造鈦錫合金之切削性研究

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摘 要

本研究延續本實驗室開發之在機械性質及切削性展現優異性質的新型鈦合金，經使用鑄造方式取得之合金樣本，進行探討一系列二元Ti-xSn(X=1、5、10、20及30 wt %)合金，以XRD繞射分析、微結構觀察、微硬度測試及切削性測試實驗分析，並以商業用純鈦(Grade II)作為對照組，期望能開發出適合作為牙科應用之鈦合金。實驗結果顯示，Ti-xSn合金之繞射峰完全與純鈦(Grade II) α 繞射峰相符，且無發現 β 相或任何的繞射鋒。Ti-xSn合金的微硬度值因Sn元素含量增加而提升，由243 HV (Ti-1Sn)至357 HV (Ti-30Sn)，Ti-30Sn合金顯示擁有最高的微硬度值。Ti-1Sn、Ti-5Sn及Ti-10Sn合金展現出韌性性質，但當Sn元素添加20 wt %或是更高時，合金之機械性質也會由韌性轉為脆性。 評估切削性，由刀具切削試片，計算不同合金之平均切削力與表面粗糙度值。結果顯示，切削條件下，Ti-xSn合金與c.p. Ti相比，當Sn元素含量增加，切削力有大幅的提升。在Sn元素含量較高時，展現出更容易加工之特性。Ti-20Sn於切削轉速110 m/min進給速度30 mm/min時，切削力為8.33 N，切削表面粗糙度值為0.57 μm，擁有最低表面粗糙度值。因此，本研究探討之Ti-xSn合金具有良好的機械性質及切削性質，相信未來在牙科鑄造及CAD/CAM加工領域，潛力無限。

關鍵詞 : 牙科合金、鈦錫合金、機械性質、微結構、切削性

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