電鍍鎳/鎳磷合金複合層之製程與機械性質研究

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摘 要

本研究以脈衝電鍍製備鎳磷合金、直流電鍍製備電鍍鎳鍍層，前者可得到低內應力高硬度之鍍層、後者可得到具有高韌性又有較佳的延展性，電鍍鎳為結構層，鎳磷合金為表面層組織製備微機電系統結構，應可改善模仁的耐用性。 本實驗結果顯示電鍍鎳/鎳磷合金複合層透過內應力量測得知鎳鍍層與鎳磷鍍層在不同的厚度比例下所呈現出整體的內應力，選擇內應力較小之比例做為本實驗複合層試片條件。 從 TEM 微結構觀察到鎳磷合合鍍層磷含量 10.7wt% 呈現為等軸晶結構伴隨著細小奈米晶粒結構，且從結構中觀察到雙晶與差排的晶粒缺陷，電鍍鎳鍍層為小晶粒與大晶粒結構。 本實驗分析試片的機械性質是利用奈米壓痕試驗，透過荷重-壓痕深度曲線圖得知材料的楊氏係數，卻無法得知複合層材料整個的楊氏係數，所以再利用一種簡單的物理方式，懸臂樑彎曲試驗來檢測材料的機械性質，前者奈米壓痕試驗得知材料單一成份的機械性質而後者懸臂樑彎曲試驗可量測多層結構的鍍層機械性質，從楊氏係數高低推估電鍍鎳結構耐衝擊，鎳磷合金容許變形量低且硬度高。

關鍵詞 : 電鍍、複合層、奈米壓痕、彎曲試驗

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