• 計畫中文名稱	以陽極氧化鋁模板運用奈米成形技術於表面改質及圖案化生醫可降解材料之應用		
• 計畫英文名稱	Application for Surface Modification and Patterns of Bio-Medical Degradable Material on Nano Forming Technology Using Anodic Alumina Oxide Template		
• 系統編號	PB9807-2038	• 研究性質	應用研究
• 計畫編號	NSC98-2221-E038-001	• 研究方式	學術補助
• 主管機關	行政院國家科學委員會	• 研究期間	9808 ~ 9907
• 執行機構	臺北醫學大學牙體技術學系		
• 年度	98 年	• 研究經費	775 千元
• 研究領域	機械工程類		
• 研究人員	沈永康		
• 中文關鍵字	陽極氧化鋁；奈米壓印；奈米射出成形；脫模；原子層沉積；細胞培養；動物實驗		
• 英文關鍵字	Anodic aluminum oxide； Nano imprint； Nano injection molding； De-molding；Atomic layer deposition； Cell culture； Animal experiment；		
• 中文摘要	本研究爲一個二年性計畫，第一年(98 年)主要爲陽極氧化鋁模板製作，以不同製程參數(電解液種類及其濃度、電壓、溫度)來探討陽極氧化鋁成形性及其品質；爾後以微電鑄法製作 Ni、Ni-Co 模仁；因爲陽極氧化鋁模板孔洞爲奈米尺寸，所翻製的 Ni，Ni-Co 模仁之結構亦爲奈米尺寸，在奈米成形(奈米壓印、奈米射出成形)過程中，易產生塑膠成品沾黏模仁問題，本年度以原子層沉積法於各式模仁上沉積氮化鉭薄膜，以增進奈米成形時模仁之脫模。接著以奈米壓印針對不同製程參數(壓印溫度，壓印壓力，壓印時間及脫模溫度)、奈米射出成形針對不同製程參數(模具溫度，融膠溫度，保壓壓力，保壓時間，冷卻時間)、不同塑膠薄膜(PP、PMMA、COP、PC、PLA)、不同塑膠材料(PP、 PMMA、COP、PC、PLA)針對陽極氧化鋁模板、Ni、Ni-Co 模仁上奈米結構於塑膠薄膜及塑膠材料之轉寫性及粗糙度研究。本年度並探討各式模仁所製成之塑膠成品表面特性 (親水性、疏水性)，同時研究奈米成形製程參數與塑膠成品表面改質之關係。本研究第二年計劃(99 年)，是使用第一年計劃方法製作陽極氧化鋁模板(不同奈米孔洞尺寸)及曲面形陽極氧化鋁模板(不同奈米孔洞尺寸)來翻製 Ni、Ni-Co 模仁，以奈米壓印來探討不同製程參數(壓印溫度、壓印壓力、壓印時間及脫模溫度)，奈米射出成形針對不同製程參數(模具溫度、融膠溫度、保壓壓力、保壓時間、冷卻時間)，不同生物可降解塑膠材料及薄膜(PLA、PLGA、PGA、PCL、PLGA/HA)製作奈米結構之薄膜，並以接觸角計量測擁有奈米結構之不同塑膠薄膜之親疏水性，以備於細胞培養時，做爲細胞黏附，擴張及分殖之參考依據；接著將此具奈米結構之塑膠薄膜(凹、凸兩種形式)於無塵室做滅菌處理，爾後以骨母細胞培養於基板上，分別於 1 天，3 天，5 天，7 天觀察其生長情形(SEM，TEM)。本年度研究最後將培養細胞之奈米結構塑膠薄膜移植於動物 (兔、狗)身上，做動物實驗，並以 1 週，2 週，3 週，1 月，3 月爲時間點做密集觀察，再由動物體內取出具奈米結構之塑膠薄膜，以 SEM，TEM 觀察細胞於動物體內之生長情形。		
• 英文摘要	The research is a two-year project. At the first year (2009), the object of this year is the fabrication of anodic aluminum oxide (AAO). This research discusses the processing property and quality of AAO by different processing parameters (the type of electrolyte and its concentration, voltage, electrical current). This research uses the micro electroforming method to produce the mold insert of Ni, Ni-Co by AAO template. This year uses atomic layer deposition (ALD) to deposite the MoN thin film on the surface of mold insert. This method can increase the de-molding property on the nano forming technology (nano imprint, nano injection molding). This research discusses the replication and surface roughness of plastic product for AAO, Ni, and Ni-Co mold insert by different processing methods and plastic materials. The different processing parameters of nano imprint are embossing temperature, embossing pressure, embossing time and de-molding temperature. The different processing parameters of nano injection molding are mold temperature, melt temperature, packing pressure, packing time and cooling time. The different plastic films and materials are PP、 PMMA、COP、PC and		

	PLA. The important point of this year is to discuss the surface properties (hydrophobia, hydrophile) of plastic product by different mold inserts and to discuss surface modification of plastic product for different processing parameters of nano forming technology. At the second year (2010), the objects of this year are cell culture on different nano patterns of plastic product and cell grow on the animal test. This year firstly fabricates the plan-AAO and curved-AAO (different sizes of nano hole) by the method of first year. Then this research also uses the micro electroforming method to fabricate the mold insert of Ni, Ni-Co by AAO template. This year also uses AAO to produce the MoN thin film on the surface of mold insert and does the nano forming experiment by different plastic materials. The processing parameters of nano forming technology (nano imprint, nano injection molding) are the same as the first year's data. The different bio-degradable plastic films and materials are PLA、 PLGA、PGA、PCL and PLGA/HA. This year also discusses the surface properties of different plastic products (concave, convex) by contact angle meter. Then this research uses the sterilization method to deal with the nano patterns of plastic product on the clear room. Then this research uses the osteoblastoma (Mg63) to culture on the nano patterns of plastic product (concave, convex). This research uses the SEM and TEM to observe the cell grow situation after 1 day, 3 day, 5 day and 7 day. The important point of this year is the animal test. This research takes the nano patterns of plastic product with osteoblastoma to transplant in the animal (rabbit, dog). Finally, this research uses SEM and TEM to observe the cell grow situation of nano patterns of plastic product from taking out animal body for one week, two week, three week, one month and three month.