List of SPD-Related Patents

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Country	Patent #	Year	Inventor(s)	Title
US[1]	5,400,633	1995	V.M. Segal, R.E. Goforth, K.T. Hartwig	Apparatus and Method for Deformation Processing of Metals, Ceramics, and Other Materials
EP[2]	0739661	1996	C.C. Bampton	Method of superplastic extrusion---equivalent to JP8300034, US5620537
US	5,513,512	1996	V. Segal	Plastic deformation of crystalline materials
US	5,590,389	1996	J. A. Dunlop, J. Yuan, J. K. Kardokus and R. A. Emigh	Sputtering target with ultra-fine, oriented grains and method of making same
US	5,600,989	1997	V. Segal	Method of and apparatus for processing tungsten heavy alloys for kinetic energy penetrators
US	5,620,537	1997	C.C. Bampton	Method of superplastic extrusion
US	5,712,431	1998	K.Vilendrer	Device and method for testing the shear response of a material in response to an applied force
US	5,780,755	1998	J. A. Dunlop, J. Yuan, J. K. Kardokus and R. A. Emigh	Sputtering target with ultra-fine, oriented grains and method of making same
US	5,809,393	1998	J. A. Dunlop, J. Yuan, J. K. Kardokus and R. A. Emigh	Sputtering target with ultra-fine, oriented grains and method of making same
US	5,826,456	1998	M. Kawazoe, J. Nagahora and K. Higashi	Method for extrusion of aluminum alloy and aluminum alloy material of high strength and high toughness obtained thereby
US	5,836,506	1998	T. J. Hunt and P. S. Gilman	Sputter target/backing plate assembly and method of making same
US	5,850,755	1998	V. Segal	Method and apparatus for intensive plastic deformation of flat billets
US	5,904,062	1999	S.L. Semiatin, D.P. DeLo	Equal Channel Angular Extrusion of Difficult-to-Work Alloys
US	6,073,830	2000	T. J. Hunt and P. S. Gilman	Sputter target/backing plate assembly and method of making same
US	6,158,492	2000	V. Rainer	Apparatus for making a foil-clad laminate
US	6,164,519	2000	P. S. Gliman, S. Kulkarni J. P. Blanchet	Method of bonding a sputtering target to a backing plate
WO[3]	0144536	2001	V. Segal	High-strength Sputtering targets and method of making same
WO	0173156	2001	V. Segal	Methods of forming aluminium-comprising physical vapor deposition targets; sputtered films; and target constructions
WO	0194660	2001	V. Segal, M. Thomas, J. Li and S. Ferrasse	Fine grain size material, sputtering target, Methods of forming, and micro-arc reduction method
US*	6,176,418	2001	T. Iwadachi	Composite bonding material of beryllium, copper alloy

[1] US patent office
[2] European Patent Office
[3] World Intellectual Property Organization

				and stainless steel and composite bonding method
US	6,197,129	2001	Y.T. Zhu, T.C. Lowe, H. Jiang and J. Huang	Method for producing ultrafine-grained materials using repetitive corrugation and straightening
US	6,209,379	2001	Y. Nishida, S. Kume and T. Imai	Large deformation apparatus, the deformation method and the deformed metallic materials
WO	0236847	2002	V. Segal	Physical vapor deposition targets, and methods of fabricating metallic materials
US	6,363,765	2002	H. K. Seok, J. C. Lee, J. W. Park Y. H. Chung and H. I. Lee	Shear deformation device for scalping
US	6,370,930	2002	J.C. Lee, H.K Seok, J.W. Park, Y.H. Chung, H.I. Loe	Continuous Shear Deformation Device
US	6,391,163	2002	V. Pavate, M. Abburi, M. Narashimhan and S. Ramaswami	Method of enhancing hardness of sputter deposited copper films
US	6,399,215	2002	Y.T. Zhu, T.C. Lowe, R.Z. Valiev, V.V. Stolyarov, V.V. Latysh, G.I. Raab	SPD processing of Ultrafine-Grained Ti and Ti Alloy for Medical Implants
US	6,422,090	2002	H.S.Ferguson	Apparatus for a thermodynamic material testing system that produces very large strains in crystalline metallic specimens and accompanying methods for use therein
US	6,569,270	2003	V. Segel	Process for producing a metal article
US	6,571,593	2003	Y.H.Chung, J.W.Park, I.G.Moon and M.C.Shin	Continuous shear deformation device
US	6,605,199	2003	A.C.Perry, P.S.Gilman and J. Van den Sype	Textured-metastable aluminum alloy sputter targets and method of manufacture
US	6,659,331	2003	S.Thach, J.Y.Sun; S.J.Wu, Y.Lin and C.C.Stow	Plasma-resistant, welded aluminum structures for use in semiconductor apparatus