金属学报 1997, 33(2) 165-174 DOI: ISSN: 0412-1961 CN: 21-1139/TG

论文

纳米结构材料(英文)

H.Gleiter

ForschungszentrumKarlsruhe;76021Karlsruhe,Germany

摘要： 纳米材料（NSM）是这样一类固体，其结构单元（大多为结晶体）至少在一个方向上具有数个纳米的特征尺寸按照结构单元的形状、化学成分可将其划分为12种类型．NsM的结构及性能不同于具相同化学成分的单晶体和玻璃．这种差别归因于品体尺寸的减少、品体形状（薄片、针和等轴）引起的维数效应以及结构单元之间界面的密度下降和配位数的变化本文讨论了支持上述观点的某些实验结果，描述了金属、大分子、半导体纳米材料的技术应用。

关键词： 纳米结构材料 界面 尺寸效应 结构与性能

NANOSTRUCTURED MATERIALS

H.Gleiter(Forschungszentrum Karlsruhe, 76021 Karlsruhe, Germany)

Abstract: Nanostructured materials (NsM) are solids composed of structural elements-mostly crvstaltites-with a characteristic size (in at least one direction) of a few nanometers.NsM may be classified into twelve groups according to the shape and chemical com-position of their constituent structural elements. The atomic structu re and properties of NsM deviate from the ones of a single crystal and / or glass with the same chemical composition. This deviation results from the reduced size of the crystallites.dlmensionality effects due to the shape of the crystallites (thin plates. needles or equiaxed shape). and the reduced densitV and / or modified coordination numbers in the interfaces between the structural elements. Some of the experimental observations supporting these ideas are discussed. Technological applications of metallic .macromolecular and semiconducting NsM are described,

Keywords: nanostructured material. interface.size effect. structure and property

收稿日期 1997-02-18 修回日期 1997-02-18 网络版发布日期

DOI:

基金项目:

通讯作者:

作者简介:

作者Email:

参考文献：

1 W.M.Tolles, Nanotechnology 7 (1996) 59.
2 H.Gleiter, Proc. Second Risul Internat. Symp. On Metall. and Matls . Sci., eds. N.Hansen. T.Leffers andH.Lilholt (Rskilde Denmark, 1981) p. 1 5.
3 H.Gleiter, Progr. Mater. Sci. 33(4) (1989) 223.
4 R.Birringer, Mater. Sct. Eng. A 117 (1989) 33.
5 C.Suryanarayana and F.H.Froes, Metall. Trans. A 23 (1992) 1071.
6 R.W.Siegel, Nanostruct. Mater. 3 (1993) 1.
7 H.Gleiter' Nanoslruct. Mater. 6 (1995) 3
8 K.L.Merkle, N.F.Reddy, C.L.WileV and D.J.Smith, Phvs. Rer. Lett. 59 (1989) 2887.
9 H.Konrad, Ph.D. Thesis 1996- Univ. of Saarbrucken, to be published.
10 S.Trapp, C.T.Limbach, U.Gonser, C.S.Campbcll and H.Gleiter, Phys. Rev. Lett 75 (1995) 3760.
11 J.Loffler, J.Weissmuller and H.Gleiter. Nanostruct. Mater. 6 (1994) 567.
12 D.Wolf J.Wang, S.R.Phillpot and H.Gleitcr. Phvs. Rev. Lett. 74 (1995) 4686.13 S.Schumacher, R.Birringer, R.Strauss and H.Gleiter. Acta Metall. 37 (1989) 2485.
14 E.D.Obraxztsova, NA TO Adv. Study Inst,Ser . E 260 (1993) 483.
15 P.Keblinski, S.R.Phillpot, D.Wolf and H.Gleiter, Acla Metall. Aater. in press.16 U.Herr, J.Jing- U.Gonser

and H.Gleiter, Solitl Slate Commun. 76 (199O) 192.
17 A.Tschope, R.Birringer and H.Gleiter. J. A phys. Phys. 71 (1992) 5391.18 H.Y.Tong, B.Z.Ding, J.T.Wang, L.Lu. J.Jiang and J.Zhu. J. .Appl. Phvs. 72 (1992) 5124.
19 J.Y.Ying, G.H.Wang, H.Fuchs, R.Laschinski and H.Gleiter, Maler. Lett. 15 (1992) 180.
20 R.W.Cahn and P.Haasen, Physical Metallurgv, Fourth Edition (Elsevier Science, Amsterdam- 1996) p.928 (Chapter 9).
21 H.E.Schaefer, R.Wurschum, H.Gleiter and I.Tsakalakos. Nanostruct. Mater. 6 (1995)
22 D.L.Bourell' Synthesis and Processing of Nanocrytalllune Aaterialc, (TMS. Warrandale, USA,1996).
本刊中的类似文章
