

(12) 按照专利合作条约所公布的国际申请

(19) 世界知识产权组织
国际局



(10) 国际公布号
WO 2025/124330 A1

(43) 国际公布日
2025 年 6 月 19 日 (19.06.2025)

(51) 国际专利分类号:
G06F 30/10 (2020.01)

杨玉杰(YANG, Yujie); 中国北京市大兴区北京经济技术开发区文昌大道8号 100176 (CN)。

(21) 国际申请号: PCT/CN2024/137728

(74) 代理人: 北京天昊联合知识产权代理有限公司(TEE & HOWE INTELLECTUAL PROPERTY ATTORNEYS); 中国北京市东城区东长安街1号东方广场东方经贸城西一办公楼5层1, 6-12室 100738 (CN)。

(22) 国际申请日: 2024 年 12 月 9 日 (09.12.2024)

(25) 申请语言: 中文

(26) 公布语言: 中文

(30) 优先权:
202311723084.7 2023年12月14日 (14.12.2023) CN

(81) 指定国(除另有指明, 要求每一种可提供的国家保护): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW。

(71) 申请人: 北京北方华创微电子装备有限公司(BEIJING NAURA MICROELECTRONICS EQUIPMENT CO., LTD.) [CN/CN]; 中国北京市大兴区北京经济技术开发区文昌大道8号 100176 (CN)。

(72) 发明人: 丁继华(DING, Jihua); 中国北京市大兴区北京经济技术开发区文昌大道8号 100176 (CN)。

(54) Title: MAGNETRON FORMING METHOD, MAGNETRON, AND MAGNETRON SPUTTERING DEVICE

(54) 发明名称: 一种磁控管的形成方法、磁控管和磁控溅射设备

S101、根据磁控管的磁极排布, 仿真获得磁控管在靶材表面任一半径处的磁场弧线各点的水平磁场强度

S101 On the basis of the arrangement of magnetic poles of a magnetron, perform simulation to obtain the horizontal magnetic field intensity of the magnetron at each point on a magnetic field arc at any radius of a surface of a target
S102 Obtain an erosion probability at any radius on the surface of the target on the basis of the horizontal magnetic field intensity at each point on the magnetic field arc at any radius of the surface of the target and a functional relationship between the horizontal magnetic field intensity and the erosion probability of the target
S103 Determine the arrangement of the magnetic poles of the magnetron on the basis of erosion probabilities at a plurality of radii of the surface of the target

S102、根据靶材表面任一半径处的磁场弧线上各点的水平磁场强度以及水平磁场强度与靶材腐蚀概率的函数关系, 获得靶材表面任一半径处的腐蚀概率

S103、根据靶材表面多个半径处的腐蚀概率, 确定磁控管的磁极排布

图 2

(57) Abstract: Disclosed in the present application are a magnetron forming method, a magnetron, and a magnetron sputtering device. The forming method comprises: on the basis of the arrangement of magnetic poles of a magnetron, obtaining the horizontal magnetic field intensity of the magnetron at each point on a magnetic field arc at any radius of a surface of a target; obtaining an erosion probability at any radius of the surface of the target on the basis of the horizontal magnetic field intensity at each point on the magnetic field arc at any radius of the surface of the target and a relationship between the horizontal magnetic field intensity and the erosion probability of the target; and determining the arrangement of the magnetic poles of the magnetron on the basis of erosion probabilities at a plurality of radii of the surface of the target. Therefore, it is not necessary to use the target to conduct magnetron sputtering experiments to obtain erosion data of the surface of the target, thereby reducing the design costs of the magnetron and shortening the design cycle of the magnetron.

[见续页]

(84) 指定国(除另有指明, 要求每一种可提供的地区保护): ARIPO (BW, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST, SZ, TZ, UG, ZM, ZW), 欧亚 (AM, AZ, BY, KG, KZ, RU, TJ, TM), 欧洲 (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG)。

本国际公布:
— 包括国际检索报告(条约第21条(3))。

(57) 摘要: 本申请公开了一种磁控管的形成方法、磁控管和磁控溅射设备, 形成方法包括: 根据磁控管的磁极排布, 获得磁控管在靶材表面任一半径处的磁场弧线上各点的水平磁场强度, 根据靶材表面任一半径处的磁场弧线上各点的水平磁场强度以及水平磁场强度与靶材腐蚀概率的关系, 获得靶材表面任一半径处的腐蚀概率, 根据靶材表面多个半径处的腐蚀概率, 确定磁控管的磁极排布, 从而不需要利用靶材进行磁控溅射实验, 来获得靶材表面的腐蚀数据, 进而可以降低磁控管的设计成本, 缩短磁控管的设计周期。