NBS TECHNICAL NOTE 524

Determination of the Light Elements in Metals: A Bibliography of Activation Analysis Papers

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PREFACE

This bibliography is the second of a series of bibliographies on the application of Activation Analysis to specific subjects. The bibliographies in this series are produced from the master files of the Analytical Chemistry Division's Activation Analysis Information Center and will be periodically updated.

W. Wayne Meinke, Chief
Analytical Chemistry Division

DETERMINATION OF THE LIGHT ELEMENTS IN METALS: A BIBLIOGRAPHY OF ACTIVATION ANALYSIS PAPERS

G. J. Lutz, Editor

References to the Determination of the Light Elements in Metals using Activation Analysis are indexed according to the elements boron, carbon, nitrogen, oxygen, phosphorous, silicon and sulfur. The indexes are arranged by Element Determined and subdivided according to Matrices and Nuclear Reactions involved. An Author Index is included.

Key words: Boron; carbon; light elements; metals; nitrogen; oxygen; phosphorous; silicon; sulfur.

INTRODUCTION

This publication, Determination of the Light Elements in Metals: A Bibliography of Activation Analysis Papers, is the second in a series of specialized bibliographies on Activation Analysis prepared by the Analytical Chemistry Division Activation Analysis Information Center.

Publications obtained by the Center for inclusion in the Activation Analysis file are indexed according to the broad categories of Element Determined, Matrix Analyzed and Technique Used. Currently there are 106 descriptive terms under Matrix Analyzed and 53 under Technique Used.

Items included in this bibliography were extracted from the Elements Determined: Boron, Carbon, Nitrogen, Oxygen, Phosphorous, Silicon and Sulfur and from the appropriate keys of Matrix Analyzed dealing with metals. The form of the indexes is by Element Determined with listings of Matrices and Nuclear Reactions involved.

An author index has been included and it is hoped that readers will point out omissions to the editor. The Center plans to publish revisions to this bibliography commensurate with the growth of the field.

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ZVYAGIN, V.I. 1546 1547 1561 3361

APPENDIX II

DETERMINATION OF LIGHT ELEMENTS IN METALS - MATRIX INDEX

BORON

ALUMINUM	1618 1787 3059 5919
GERMANIUM	2712
METALS, GENERAL	7285
NICKEL ALLOYS	3976
SILICON	181 1013 1091 1546 1547 1561 2712 3361 5429
STEEL	1821 3466 5408 5932 7361

CARBON

ALUMINUM	4 578 688 703 767
BERYLLIUM	45 46 49 578 1263 1816 2505 3070 3727 3976
BORON	1816
CALCIUM	1816
CESIUM	4386
GERMANIUM	1604 6752 7015
GOLD	105 1599 1831 7011
IRON	4 8 401 417 703 744 1219 5954 7015 7018
IRON-ALUMINUM ALLOYS	578
LEAD-BISMUTH ALLOYS	7017
METALS, GENERAL	7213
MOLYBDENUM	3070 6742
NICKEL	1604 6593 6752
NIOBIUM	7015
PLATINUM	7011
SILICON	1831 6581 6593 6736 7019 7307
SILVER	105
SODIUM	1560 1816
STEEL	118 119 351 1026 1604 1951 2652 5238 6742 6752 7162

CARBON (CONTINUED)

TANTALUM	1604 3977 6752 7015
TERBIUM	4226
TUNGSTEN	3070
ZIRCONIUM	703 1604 6752

NITROGEN

ALUMINUM	703
BERYLLIUM	49 703 1263 1816 2505 3070 3976
IRON	7015
METALS, GENERAL	5238 7213 7343
MOLYBDENUM	3070
NIOBIUM	5782 7015
SILICON	7019
TUNGSTEN	3070
ZIRCONIUM	703 760

OXYGEN

ALUMINUM	578 654 655 1067 1589 1804 3721 3722 3771 3992 4211 5409 5432 5772 5921 6595 6694 6978 7012
AMERICIUM	4226
BERYLLIUM	45 46 49 58 108 109 391 500 578 596 814 1103 1104 1263 1318 1816 2505 2549 2686 3070 3073 3090 3727 3976 4277 7097 7214
BISMUTH	5772
BORON	1816 4260
CADMIUM	5772
CALCIUM	1816
CERIUM	500
CESIUM	131 4386
CHROMIUM	500 3090 6591 7230

OXYGEN (CONTINUED)

COBALT	5772
COPPER	655 1067 1103 3768 5772 7387
CURIUM	4226
GERMANIUM	1604 1739 6053 6072 6752
GOLD	105 655 1831 7011
HAFNIUM	2381 5938 6590
IRON	426 655 1067 1589 2649 3768 6591 7015 7230 7330
IRON-ALUMINUM ALLOYS	578 1067
LANTHANUM	500
LEAD	5772
LEAD-BISMUTH ALLOYS	7017
LITHIUM-MAGNESIUM ALLOYS	2562
MAGNESIUM	2798 3357 3981
METALS, GENERAL	1158 1483 1823 1915 2802 3986 6742 7213 7417
MOLYBDENUM	500 1067 1589 2381 3070 3768 5321 5938 6590 6705
NICKEL	426 655 1067 1604 6591 6752 7230
NIOBIUM	1103 1589 1739 5772 5781 7015
PLATINUM	655 7011
POTASSIUM	1900 2598 2734 3085
SELENIUM	7307
SILICON	1151 1194 1742 6053 6072 6593 6978 7015 7019 7248
SILICON-IRON ALLOYS	1589 2418
SILVER	105
SILVER-ZIRCONIUM ALLOYS	3977
SODIUM	1816 7106

OXYGEN (CONTINUED)

STEEL	426 500 1067 1103 1394 1453 1604 1950 1956 2507 2526 2542 2586 2615 2649 2678 2764 2983 3357 3502 3746 3768 3981 5238 5380 5450 5451 5452 5708 5772 6595 6728 6752 6856 7076 7142 7289 7291 7330 7344 7419
TANTALUM	912 1067 1604 3090 3977 5772 6752
TERBIUM	4226
THORIUM	105 1318 1730
TIN	500
TITANIUM	426 1067 1103 1739 3357 3981 4277 5431 5772 5781 6750
TUNGSTEN	500 1067 2381 3070 3768 5938 6590
VANADIUM	500
ZINC	5772
ZIRCALLOY	426 1067 1309 3768
ZIRCONIUM	655 762 1103 1604 2381 3090 3721 4277 5772 5938 6590 6595 6752 7012 7200

PHOSPHOROUS

ALUMINUM	4 161 398 688 767 979 2550 6410
ALUMINUM-SILICON ALLOYS	864
ANTIMONY	985 2721
COPPER	1477 2550 6412
GALLIUM	2721
GOLD	1193
IRON	4 140 223 688 767 893 1965 6568
MAGNESIUM	22 6410
MOLYBDENUM	7145
NICKEL	892 6568
NICKEL ALLOYS	7172

PHOSPHOROUS (CONTINUED)

NIOBIUM	641 1165 1709
SELENIUM	1215 1520 6446
SILICON	244 246 255 509 892 1118 1166 2386 2523 6226 6572
STEEL	893 1085 1124 2764 6086
TANTALUM	1165
TELLURIUM	1215
THALLIUM	2721
TUNGSTEN	7145
ZIRCONIUM	1471 1709 2550

SILICON

ALUMINUM	4 102 417 1591
BERYLLIUM	850 1263
IRON	4 452 628 1590 1875
MAGNESIUM	7407
NICKEL ALLOYS	6844
NIOBIUM	641
STEEL	628 2429 2596 6086 6398 6723 7170
TITANIUM	81
ZIRCONIUM	1709

SULFUR

ALUMINUM	688 704 767 2550 6410 6412 6568
CHROMIUM	1570
COPPER	1378 1477 2550 6410 6412 6568
GOLD	1193
IRON	140 688 767 1621 1965 6410 6412 6568
MAGNESIUM	22 6410 6412 6568
NICKEL	6410 6412 6568

SULFUR (CONTINUED)

NICKEL ALLOYS	7172
NIOBIUM	641
SELENIUM	1215 1520 4300 6446
SILICON	892
STEEL	893 1085 1124 1711 2764 6086
TELLURIUM	1215
ZIRCONIUM	1471 1709 2550

APPENDIX III

DETERMINATION OF LIGHT ELEMENTS IN METALS - REACTION INDEX

BORON

$^{11}B(p,n)^{11}C$	181 1013 1091 2712
$^{10}B(d,n)^{11}C$	2712
$^{10}B(n,\alpha)^{7}Li$ - electronic α counting	1546 1547 1561 1618 1787 3059 3361 5429
$^{10}B(n,\alpha)^{7}Li$ - α track counting	5408 5932
$^{10}B(n,\alpha)^{7}Li$ - neutron flux depression	1821
$^{10}B(n,\alpha)^{7}Li$ - prompt ^{7}Li gamma ray	1546 1547 1561 3361 3466 5919 7285 7361
Deuteron bombardment - prompt gamma ray	3976

CARBON

$^{12}C(d,n)^{13}N$	4 8 118 119 417 688 744 767 1219 1951 2505 3070 3976 5238 6581 6736 7307
$^{12}C(\gamma,n)^{11}C$	45 46 49 351 703 1263 1560 1816 3727 4386 5954 6593 6742 7015 7017 7018
$^{12}C(^{3}He,\alpha)^{11}C$	105 1599 1604 1831 3977 4226 6752 7011 7019 7162
$^{12}C(p,\gamma)^{13}N$	401 744 1026 1219
$^{12}C(\alpha,\alpha n)^{11}C$	578
$^{12}C(d,p)^{13}C$ - (prompt γ detection)	2652

DETERMINATION OF LIGHT ELEMENTS IN METALS - REACTION INDEX

NITROGEN

$^{14}N(\gamma,n)^{13}N$	49 703 760 1263 1816 7015
$^{14}N(d,n)^{15}O$	2505 3070 3976
$^{14}N(d,n)$ - prompt neutron detection	5238
$^{14}N(n,2n)$ - C-W generator	5782
$^{14}N(p,\alpha)^{11}C$	7019

OXYGEN

$^{16}O(n,p)^{16}N$ - 14 MeV neutrons from Cockcroft Walton generator	108 109 131 426 500 596 762 1067 1103 1104 1309 1394 1453 1589 1739 1804 1900 1950 1956 2418 2505 2507 2526 2542 2549 2586 2598 2615 2649 2678 2686 2734 2764 2798 2802 2983 3073 3085 3090 3357 3502 3746 3768 3981 4260 5321 5380 5409 5431 5432 5451 5452 5708 5772 5781 6694 6705 6728 6750 6856 6978 7076 7097 7142 7214 7289 7291 7330 7344 7387 7417 7419
$^{16}O(\alpha,pn)^{18}F$	578 1151 1194 1742 2381 3722 5921 5938 6590 6591 6593 7015 7230 7248
$^{18}O(p,n)^{18}F$	912 1483
$^{18}O(\gamma,p)^{17}N$	4277
$^{16}O(t,n)^{18}F$ - accelerator produced tritons	7012
$^{16}O(n,p)^{16}N$ - reactor neutrons	3986
$^{16}O(d,n)^{17}F$	3070 3976 5238 7307
$^{16}O(d;p)^{17}O$ - prompt γ's	6595
$^{16}O(p,\alpha)^{13}N$	7248

OXYGEN (Continued)

$^{16}O(\gamma,n)^{15}O$	45 46 49 58 814 1263 1816 3727 3771 4386 6742 7015 7017 7106
$^{16}O(^{3}He,p)^{18}F$	105 1318 1604 1831 2381 3721 3977 4211 4226 5921 5938 6053 6072 6590 6752 7011 7015 7019 7230 7248
$^{16}O(t,n)^{18}F$; tritons from $^{6}Li(n,\alpha)t$	391 654 655 1158 1730 2562 3992

PHOSPHOROUS

$^{31}P(n,\gamma)^{32}P$	4 22 140 161 223 244 246 255 398 509 641 688 767 864 892 893 979 985 1085 1118 1124 1165 1166 1193 1215 1471 1477 1520 1709 2386 2523 2550 2721 2764 6086 6226 6410 6412 6446 6568 6572 7145 7172

SILICON

proton scattering	2429
$^{28}Si(n,\gamma)^{29}Si$	4 81 102 417 452 641 850 1263 1709 6086 7407
$^{28}Si(n,p)^{28}Al$ - C-W Generator	628 1875 2596 6398 6723 6844 7170
$^{28}Si(n,p)^{28}Al$ - Po-Be source	1590 1591

SULFUR

$^{34}S(n,\gamma)^{35}S$	22 140 641 688 767 892 893 1085 1124 1193 1215 1378 1471 1477 1520 1621 1711 2550 6086 6410 6446 6568
$^{32}S(n,p)^{32}P$	704 1520 1570 1709 1965 2764 4300 6412 6446 6568 7172

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