

## Bibliography

- [1] R. A. Adams, *Sobolev spaces*, Academic Press, New York, 1975.
- [2] L. V. Ahlfors and A. Beurling, *Conformal invariants and function theoretic nullsets*, Acta Math. 83 (1950), 101-129.
- [3] M. S. M. Akal, *Boundary value problem for complex elliptic partial differential equations of higher order*, Ph.D thesis, Freie University Berlin, 1996.
- [4] E. Almansi, Sull'integrazione dell'equazione differenziale  $\Delta^{2n} = 0$ , Ann. Math. 3(2), (1899), 1-59.
- [5] S. Axler, P. Bourdon, W. Ramey, *Harmonic function Theory*, 2. Ed., Graduate Texts in Mathematics 137, Springer-Verlag, New York, Berlin, Heidelberg, 2001.
- [6] H. Bahmann, M.V. Shapiro, Gürlebeck. K., W. Sprößig. W:On a modified Teodorescu transform, Integral Transforms and Special Functions, Vol.12, No 3, (2001), 213-226.
- [7] H. Begehr, *Complex analytic method for partial differential equations*, An introductory text. World Scientific, Singapore, 1994.
- [8] H. Begehr, *Elliptic second order equations*, in: *Functional analytic methods in complex analysis and applications to partial differential equations*, (W. Tutschke and A.S. Mshimba, eds), World Scientific, Singapore, 1995, 115-152.
- [9] H. Begehr, *Interated integral operator in Clifford analysis*, ZAA 18 (1999), 361-377.
- [10] H. Begehr, *Integral representations for differentiable funtions*, Problemi attual dell'analisi e della fisica matematica. Ed. P. E. Ricci. Aracne, Roma, 2000, 111-130.
- [11] H. Begehr, *Integral representation in complex, hypercomplex and Clifford analysis*, Lecture Notes. Minicorsi, Padova, 2000, 53-77; Integral Transf. Special Functions 13 (2002), 223-241.
- [12] H. Begehr, *Some boundary value problems for bi-bianalytic functions*, Complex Analysis, Differential Equation and Related Topics. Proc. ISAAC Conf. on Analysis, Yerevan, 2002, to appear.
- [13] H. Begehr, Ju. Dubinskii *Orthogonal decompositions of Sobolev spaces in Clifford analysis*, Annali Mat. 181. (2002), 55-71.
- [14] H. Begehr, J.-Y. Du, Z.-X Zhang, *On Cauchy-Pompeiu formulas for functions with values in a universal Clifford algebra*, Acta Math. Scientia 23B (2003), 95-103.
- [15] H. Begehr, A. Dzhuraev, *An introduction to several complex variables and partial differential equation*, Addison Wesley Longman, Harlow, 1997.
- [16] H. Begehr, G. N. Hile, *A hierarchy of integral operators*, Rocky Mountain J. Math. 27 (1997), 669-706.
- [17] H. Begehr, G. N. Hile, *Higher order Cauchy-Pompeiu operators*, Theory for Complex and Hypercomplex Analysis, (eds. E. Ramires de Arellano eta ln,) Contemporary Math 212 (1998), 41-49.
- [18] H. Begehr and G. N. Hile, *Nonlinear Riemann boundary value problems for a nonlinear elliptic system in the plane*, Math.Z. 179 (1982), 241-261.
- [19] H. Begehr and G. N. Hile, *Riemann boundary value problems for a nonlinear elliptic system*, Complex Variables, Theory Appl. 1 (1983), 239-261.
- [20] S. Bernstein, *Elliptic boundary value problems in unbounded domains*, in: Clifford Algebra and their Applications in Mathematical Physics (eds., F. Brackx, R. Delanghe, H. Serras,) Dordrecht, Kluwer 1993.
- [21] S. Bernstein, *The quaternionic Riemann problem*, Contemporary Mathematics, 232, (1999), 69-83.
- [22] S. Bernstein, *On the index of Clifford algebra valued singular intergral operators and the left linear Riemann problem*, Complex Variables, Theory Appl. 35 (1998), 33-64.
- [23] S. Bernstein, *Monogenic functions of bounded mean oscillation in the unit ball*, Trends in Mathematics: Advances in Analysis and Geometry, Birkhäuser Verlag Basel, (2004), 31-50.

- [24] L. Bers, *Theory of pseudo - analytic functions*, Institute of Mathematics and Mechanics, New York University, 1953.
- [25] A. V. Bitsadze *Boundary value problems for second - order elliptic equations*, Amsterdam, North - Holland and N. Y. Interscience, 1968.
- [26] B. Bojarski, *Subsonic flow of compressible fluid*, Arch. Mech. Stos. 18 (1966), 497-519; *The math. problems in fluid mechanics*, Polish Acad. Sci. Warszawa (1967), 9-32.
- [27] A. P. Calderon and A. Zygmund, *On the existence of certain singular integrals*, Acta. Math. 88, (1952), 85-139.
- [28] D.L. Colton, *Analytic theory of partial differential equations*, Pitman Advanced Publishing Program, Boston, London, Melbourne, 1980.
- [29] D.L. Colton, R. Kress, *Inverse acoustic and electromagnetic scattering theory*, Springer-Verlag Berlin Heidelberg, 1992.
- [30] R. Courant, D. Hilbert, *Methods of mathematical physics*, Engl Transl, Interscience Publishers, Inc., New York, Vol. 1, 1953.
- [31] Ju. Dubinskii, *On a nonlinear analytic problem*, Russian Acad. Sci. Dokl. Math. 48 (1994), 370-375.
- [32] Ju. Dubinskii, *Some orthogonal expansions and nonlinear analytic problems*, Diff. Equa. 31(1995), 241-253.
- [33] Ju. Dubinskii, A. Osipenko, *Nonlinear analytic and coanalytic problems*, Math. Sbornik 191 (2000), 65-102 (Russian).
- [34] Ju. Dubinskii, *Some orthogonal decompositions of the Sobolev spaces  $W_2^1$  and  $W_2^0$  and its applications to the Stokes problem*, Doklady RAS 374,(2000), 13-16.
- [35] R. J. Duffin, *Yukawa potential theory*, Math. Anal. Appl. 35 (1971), 105-130.
- [36] A. Dzhuraev, *Methods of singular integral equations*, Longman, Harlow, 1992.
- [37] A. Dzhuraev, *Degenerate and other problems*, Longman, Harlow, 1992.
- [38] L. C. Evans, *Partial differential equations*, American Mathematical Society, 1999.
- [39] E. B. Fabes, M. Jodeit, J. R and N. M. Rivière, *Potential techniques for boundary value problems on  $C^1$  domains*, Acta. Math. 141 (1978), 165-186.
- [40] J. E. Gilbert, M. A. M. Murray *Clifford algebras and Dirac operators in harmonic analysis*, Cambr. Studies in Advanced Mathematics, Cambridge 26, 1990.
- [41] K. Gürlebeck, *Hypercomplex factorization of the Helmholtz equation*, ZAA 5(2) (1986), 125-131.
- [42] K. Gürlebeck, *On some operators in Clifford analysis*, Proceedings of the International Conference on Complex and Hypercomplex Analysis and Operator Theory, held in Mexico City, December 1994, 12-17.
- [43] K. Gürlebeck, U. Kähler, *On a boundary value problem of the biharmonic equation*, Math. Methods Appl. Sci. 20, (1997), 867-883.
- [44] K. Gürlebeck, U. Kähler, J. Ryan, W. Sprößig, *Clifford analysis over unbounded domains*, Adv. Appl. Math. 19 (1997), 216-239.
- [45] K. Gürlebeck, M.V. Shapiro, W. Sprößig, *On a Teodorescu transform for a class of metaharmonic functions*, J. Nat. Geom. 21, No 1-2 (2002), 17-38.
- [46] K. Gürlebeck, W. Sprößig, *Quaternionic analysis and elliptic boundary value problems*, Akademie-Verlag Berlin and Birkhäuser Verlag Basel, 1989.
- [47] K. Gürlebeck, W. Sprößig, *Quaternionic and Clifford calculus for physicists and engineers*, John Wiley and Sons, Chichester, 1997.
- [48] F. Gürsey, H. C. Tze, *On the role of division, Jordan and related algebras in particle physics*, World Scientific, Singapore 1996.
- [49] Vu Thi Ngoc Ha, *Integral representation in quaternionic analysis related to the Helmholtz operator*, Complex Variables Theory Appl. 48 (2003) 1005-1021.
- [50] Vu Thi Ngoc Ha, *Higher order Teodorescu operators and Cauchy-Pompeiu type formulas related to polynomial operators in quaternionic analysis*, ZAA, to appear.
- [51] Vu Thi Ngoc Ha, *Higher order Teodorescu operators in quaternionic analysis related to the Helmholtz operator*, preprint, FU Berlin, 2004.
- [52] Vu Thi Ngoc Ha, *On decompositions of the complex quaternion-valued Hilbert space related to the Helmholtz equation*, Proceedings of the Workshop on recent trends in Applied Complex Analysis,

- held in METU. Department of Mathematics, Ankara, Turkey, June, 2004, to appear in Journal Nonlinear Functional Analysis.
- [53] L. Hedberg, *On certain convolution inequalities*, Proc. Amer. Math. Soc. 36(1972), 505-510.
  - [54] L. Huang, *The modified Helmholtz equations and their boundary value problems*, Selected papers of Tongji University 1989, 37-54.
  - [55] L. Huang, *The existence and uniqueness theorems of the linear and nonlinear Riemann-Hilbert problems for the generalized holomorphic vectors of the second kind*, Acta Math. Sci. (Engl. Ed) 10(2) (1990), 185-199.
  - [56] U. Kähler, *Elliptic boundary value problems in bounded and unbounded domains*, Dirac Operators in Analysis: Eds., J. Ryan, D. Stuppa, Harlow, Addison Wesley 1998.
  - [57] U. Kähler, *On a direct decomposition of the spaces  $L_p(\Omega)$* , ZAA 18 (1999), 839-848.
  - [58] K. V. Khmelnytskaya, V. V. Kravchenko, V. S. Rabinovich, *Quaternionic fundamental solutions for electromagnetic scattering problems and application*, ZAA 22, (2003) 147-166.
  - [59] J. B. Kuipers, *Quaternions and rotation sequences*, Princeton Uni. Press, 1999.
  - [60] V. V. Kravchenko, *Applied Quaternionic Analysis*, Heldermann Verlag, Berlin, 2003.
  - [61] V. V. Kravchenko, *On the relation between holomorphic biquaternionic functions and time - harmonic electromagnetic fields*, Deposited in Ukr INTEI, 29.12.1992, № 2073-Uk-92, 18pp.
  - [62] V. V. Kravchenko, *Quaternion-valued integral representations for time-harmonic electromagnetic and spinor fields*, Dokl. Math 51, No.2 (1995), 287-289.
  - [63] V. V. Kravchenko, *On a biquaternionic bag model*, ZAA 14, (1995), 3-14.
  - [64] V. V. Kravchenko, M. V. Shapiro, *Integral representations for spatial models of mathematical physics*, Research Notes Math. 351, Pitman Advanced Publi. Prog, London, 1996.
  - [65] V. V. Kravchenko, M. V. Shapiro, *Helmholtz operator with a quaternionic wave number and associated function theory*, Dept. de Mat., CINVESTAV del IPN, Mexico, D. F. Reporte Interno No. 96, April 1992. Also in J. Lawrynowicz(ed.), Deformations of the Mathematical Structures, Kluwer Academic Publishers, Dordrecht, 1993, 101-128.
  - [66] V. V. Kravchenko, M. V. Shapiro, *Helmholtz operator with a quaternionic wave number and associated function theory, II. Integral representations*, Acta Appl. Math. 32, No 3 (1993), 243-265.
  - [67] P. A. Krutitskii, *The Dirichlet problem for the dissipative Helmholtz equation in a plane domain bounded by closed and open curves*, Hiroshima Math. J. 28, (1998), 149-168.
  - [68] J. L. Lions, E. Magenes, *Non-homogeneous boundary value problems and applications*, Engl. transl. by P. Kenneth, Vol. 1, Springer-Verlag, Berlin Heidelberg, New York, 1972.
  - [69] S. G. Michlin, S. Prößdorf, *Singular integral operators*, Akademie-Verlag, Berlin, 1986.
  - [70] R. von Mises, *Integral theorems in three - dimensional potential flow*, Bull. Amer. Math. Soc. 50 (1944), 599-611.
  - [71] M. Mitrea, *Boundary value problems and Hardy spaces associated th the Helmholtz equation in Lipschitz domains*, Math. Anal Appl. 202, (1996), 819-842.
  - [72] S. Mizohata, *The theory of partial differential equations*, Cambridge Univ. Press, 1973.
  - [73] A. Mshimba, *A mixed boundary value problem for generalized polyanalytic function of order n in the Sobolev space  $W_{n,p}(D)$* , Complex Variables Theory Appl. 47 (2002), 1097-1106.
  - [74] A. Mshimba, *A Mixed boundary value problem for polyanalytic function of order n in the Sobolev space  $W_{n,p}(D)$* , Complex Variables Theory Appl. 47 (2002), 1107-1114.
  - [75] E. I. Obolashvili, *Partial differential equations in Clifford analysis*, Pitman Monographs and Surveys in Pure and Applied Mathematics, Addison Wesley Longman Ltd, Harlow, 96, 1998.
  - [76] M. Renardy, R. C. Rogers, *An introduction to partial differential equations*, Springer-Verlag, New York, 1992.
  - [77] M. V. Shapiro, N. L. Vasilevski *On the Bergman kernel function in hyperholomorphic analysis*, Inter. 115, Cinvestav del IPN, 1993.
  - [78] M. V. Shapiro, N. L. Vasilevski *Quaternionic  $\psi$ -hyperholomorphic functions, singular integral operators and boundary value problems, I.  $\psi$ -hyperholomorphic functions theory*, Complex Variables, Theory Appl. 27 (1995), 17-46.
  - [79] M. V. Shapiro, N. L. Vasilevski *Quaternionic  $\psi$ -hyperholomorphic functions, singular integral operators and boundary value problems, II. Algebras of singular integral operators and Riemann type boundary value problems*, Complex Variables, Theory Appl. 27 (1995), 67-96.

- [80] F. Sommen, Z. Xu, *Fundamental Solutions for operators which are polynomial in the Dirac operator*, Clifford Algebra and their Applications in Mathematical Physics Eds. Micali, A., Boudet, R., and Helmstetter, Kluwer, Dordrecht, 1992, 313-326.
- [81] W. Sprößig, *Raeumliches Analogon zum komplexen T-Operator*, Beitraege Analysis 12 (1978), 127-137.
- [82] W. Sprößig, *On decompositions of the Clifford valued Hilbert space and their applications to boundary value problems*, Advances in Applied Clifford Algebras 5, 2 (1995), 167-186.
- [83] W. Sprößig, *On generalized Vekua type problems*, Advances in Applied Clifford Algebras 11, (2001), 77-92.
- [84] H. Triebel, *Theory of function spaces II*, Birkhäuser Verlag Basel, 1992.
- [85] N. L. Vasilevski *On quaternionic Bergman and poly - Bergman spaces*, Complex Variables, Theory Appl. 41, (2000), 111-132.
- [86] I. N. Vekua, *Genneralized analytic functions*, Pergamon Press, Oxford, 1962.
- [87] G. Verchota, *Layer potentials and boundary value problems for Laplace's equation on Lipschitz domains*, Ph.D. thesis, University of Minnesota, 1982.
- [88] V. S. Vladimirov, *Equations of mathematical physics*, Engl transl. of first ed., N. Y. Marcel Dekker, 1971.
- [89] G. C. Wen, H. Begehr *Boundary value problems for elliptic equations and systems*, Longman, Harlow, 1990.
- [90] G. C. Wen, S. X. Kang, *The oblique derivative boundary value problem for elliptic systems of fourth order*, Sichun ShiFan Daxue Xuebao Ziran Kexue Ban 2 (1983), 53-64.
- [91] Z. Xu, *Boundary value problems and function theory for Spin-invariant differential operators*, Ph.D. thesis, Ghent State Univ. 1989.
- [92] Z. Xu, *A function theory for the operator  $D - \lambda$* , Complex Variables, Theory Appl. 16 (1991), 27-42.
- [93] Z. Xu, *Helmholtz equations and boundary value problems*, Partial differential equations with complex analysis, eds., H. Begehr and A. Jeffrey,, Pitman Research Notes in Mathematics Series 262, Longman, Harlow, 1992, 204-214.

## Index

- $\alpha$ -hyperholomorphic function,
  - left(right)-,16
  - poly-,61
- Cauchy integral formula,15, 19
- Cauchy-Pompeiu integral formula,18, 61
- Dirichlet problem,43, 46, 50, 69
- Generalization of Leibniz's rule,14
- Helmholtz
  - higher-order – equation, 55
  - first-order – operator,16
- Hölder's inequality,13
- Integral representations for,
  - higher order  $D_\alpha$ ,22, 24, 25
  - metaharmonic functions,60
  - powers of the Helmholtz,65
  - polynomial operator,74
- Isomorphic embedding,11
- Metaharmonic function, 61
  - poly-,61
- Moisil-Teodorescu,
  - differential operator,13
  - system,14
- Orthogonal decomposition,47, 61
- Plemelj-Sokhotzkij formula,44
- quaternions
  - Algebra of real-,10
  - Complex-,10
  - conjugator of-,10
  - norm of-,10, 11
- spaces
  - Banach-,12
  - Hilbert-module,12
  - Sobolev-,12, 15
- Sobolev imbedding theorem,13
- Teodorescu
  - first-order operators,21
  - higher-order operators,27