PRODUCTS OF RADIAL DERIVATIVE AND MULTIPLICATION OPERATOR BETWEEN MIXED NORM SPACES AND ZYGMUND-TYPE SPACES ON THE UNIT BALL

JIE ZHOU AND YONGMIN LIU

Abstract. In this paper, we obtain some characterizations of the boundedness and compactness of the products of the radial derivative and multiplication operator $\Re M_u$ between mixed norm spaces $H(p, q, \phi)$ and Zygmund-type spaces on the unit ball.

Mathematics subject classification (2010): 47B38, 47G10, 32A10, 32A18.

Keywords and phrases: Unit ball, mixed norm space, Zygmund-type space, radial derivative operator, multiplication operator.

REFERENCES

- Z. HU, Extended Cesàro operators on mixed norm spaces, Proc. Amer. Math. Soc. 131, 7 (2003), 2171–2179 (electronic).
- [2] B. LI, C. OUYANG, Higher radial derivative of functions of Q_p spaces and its applications, J. Math. Anal. Appl. 327, 2 (2007), 1257–1272.
- [3] S. LI, S. STEVIĆ, Generalized composition operators on Zygmund spaces and Bloch type spaces, J. Math. Anal. Appl. 338, 2 (2008), 1282–1295.
- [4] S. LI, S. STEVIĆ, Products of Volterra type operator and composition operator from H[∞] and Bloch spaces to Zygmund spaces, J. Math. Anal. Appl. 345, 1 (2008), 40–52.
- [5] S. LI, S. STEVIĆ, Composition followed by differentiation between H[∞] and α-Bloch spaces (English summary), Houston J. Math. 35, 1 (2009), 327–340.
- [6] S. LI, S. STEVIĆ, Integral-type operators from Bloch-type spaces to Zygmund-type spaces, Appl. Math. Comput. 215, 2 (2009), 464–473.
- [7] S. LI, S. STEVIĆ, Products of composition and differentiation operators from Zygmund spaces to Bloch spaces and Bers spaces, Appl. Math. Comput. 217 (2010), 3144–3154.
- [8] Y. LIU, Boundedness of the Bergman type operators on mixed norm spaces, Proc. Amer. Math. Soc. 130, 8 (2002), 2363–2367 (electronic).
- [9] Y. LIU, Y. YU, Weighted differentiation composition operators from mixed-norm to Zygmund spaces, Numer. Funct. Anal. Optim. 31, 8 (2010), 936–954.
- [10] Y. LIU, Y. YU, On compactness for iterated commutators, Acta Math. Sci. Ser. B Engl. Ed. 31B, 2 (2011), 491–500.
- [11] Y. LIU, Y. YU, *Composition followed by differentiation between* H^{∞} *and Zygmund spaces*, Complex. Anal. Oper. Theory **6**, 1 (2012), 121–137.
- [12] W. RUDIN, Function Theory in the Unit Ball of \mathbb{C}^n , Springer-Verlag, New York-Berlin, 1980.
- [13] A.L. SHIELDS, D.L. WILLIAMS, Bounded projections, duality, and multipliers in spaces of analytic functions, Trans. Amer. Math. Soc. 162 (1971), 287–302.
- [14] S. STEVIĆ, Boundedness and compactness of an integral operator on mixed norm spaces on the polydisc, Siberian Math. J. 48, 3 (2007), 559–569.
- [15] S. STEVIĆ, Weighted composition operators between mixed norm spaces and H_{α}° spaces in the unit ball, J. Inequal. Appl. **2007** (2007), Art. ID 28629, 9 pp. doi:10.1155/2007/28629.
- [16] S. STEVIĆ, Weighted differentiation composition operators from mixed-norm spaces to weighted-type spaces, Appl. Math. Comput. 211, 1 (2009), 222–233.



- [17] S. STEVIĆ, On an integral operator from the Zygmund space to the Bloch-type space on the unit ball, Glasg. J. Math. 51 (2009), 275–287.
- [18] S. STEVIĆ, On an integral-type operator from logarithmic Bloch-type and mixed-norm spaces to Bloch-type spaces, Nonlinear Anal. 71, 12 (2009), 6323–6342.
- [19] S. STEVIĆ, On a new integral-type operator from the Bloch space to Bloch-type spaces on the unit ball, J. Math. Anal. Appl. 354, 2 (2009), 426–434.
- [20] S. STEVIĆ, On an integral-type operator from logarithmic Bloch-type spaces to mixed-norm spaces on the unit ball, Appl. Math. Comput. 215, 11 (2010), 3817–3823.
- [21] S. STEVIĆ, On operator P_{ϕ}^{g} from the logarithmic Bloch-type space to the mixed-norm space on the unit ball, Appl. Math. Comput. **215**, 12 (2010), 4248–4255.
- [22] S. STEVIĆ, Extended Cesàro operators between mixed-norm spaces and Bloch-type spaces in the unit ball, Houston J. Math. 36, 3 (2010), 843–858.
- [23] S. STEVIĆ, Composition followed by differentiation from H[∞] and the Bloch space to nth weightedtype spaces on the unit disk, Appl. Math. Comput. 216, 12 (2010), 3450–3458.
- [24] S. STEVIĆ, On an integral-type operator from Zygmund-type spaces to mixed-norm spaces on the unit ball, Abstr. Appl. Anal. 2010 (2010), Article ID 198608, 7 pp..
- [25] S. STEVIĆ, Weighted iterated radial composition operators between some spaces of holomorphic functions on the unit ball, Abstr. Appl. Anal. 2010 (2010), Article ID 801264, 14 pp..
- [26] S. STEVIĆ, On an integral operator between Bloch-type spaces on the unit ball, Bull. Sci. Math. 134 (2010), 329–339.
- [27] S. STEVIĆ, On a product-type operator from Bloch spaces to weighted-type spaces on the unit ball, Appl. Math. Comput. 217 (2011), 5930–5935.
- [28] S. STEVIĆ, On some integral-type operators between a general space and Bloch-type spaces, Appl. Math. Comput. 218, 6 (2011), 2600–2618.
- [29] S. STEVIĆ, Boundedness and compactness of an integral-type operator from Bloch-type spaces with normal weights to F(p,q,s) space, Appl. Math. Comput. **218**, 9 (2012), 5414–5421.
- [30] S. STEVIĆ, Weighted iterated radial operators between different weighted Bergman spaces on the unit ball, Appl. Math. Comput. 218, 17 (2012), 8288–8294.
- [31] S. STEVIĆ, A. K. SHARMA, Iterated differentiation followed by composition from Bloch-type spaces to weighted BMOA spaces, Appl. Math. Comput. 218, 7 (2011), 3574–3580.
- [32] S. STEVIĆ, S. I. UEKI, Integral-type operators acting between weighted-type spaces on the unit ball, Appl. Math. Comput. 215, 7 (2009), 2464–2471.
- [33] X TANG, Extended Cesàro operators between Bloch-type spaces in the unit ball of Cⁿ, J. Math. Anal. Appl. 326, 2 (2007), 1199–1211.
- [34] W. YANG, Products of composition and differentiation operators from $Q_K(p,q)$ spaces to Bloch-type spaces, Abstr. Appl. Anal. **2009** (2009), Article ID 741920, 14 pp.
- [35] X. ZHANG, J. XIAO, Z. HU, The multipliers between the mixed norm spaces in \mathbb{C}^n , J. Math. Anal. Appl. **311**, 2 (2005), 664–674.
- [36] K. ZHU, Spaces of Holomorphic Functions in the Unit Ball, Graduate Text in Mathematics 226, Springer, New York, 2005.
- [37] X. ZHU, Products of differentiation, composition and multiplication from Bergman type spaces to Bers type spaces (English summary), Integral Transforms Spec. Funct. 18, 3/4 (2007), 223–231.
- [38] X. ZHU, Integral-type operators from iterated logarithmic Bloch spaces to Zygmund-type spaces, Appl. Math. Comput. 215, 3 (2009), 1170–1175.