Bases on Köthe spaces

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In the context of Köthe spaces we study the bases related with the backward and forward unilateral weighted shift operators, the so-called generalized derivation and integration operators, extending known results for spaces of analytic functions. These bases are closely connected with the isomorphisms that commute with the weighted shift.

In the study of bases in analytic spaces, forward weighted shift operators (multiplication and integration operators) play an important role and so they figure in the papers of many Russian mathematicians [1]. As our spaces are projective limits of Banach spaces we are able to characterize the forward shift-invariant isomorphisms and so determine some special quasi-power bases in Köthe spaces. Our results include, as particular cases, those found by Nagnibida for the multiplication and integration operators in the space of analytic functions in a disc [1] and Prada for the multiplication operator on infinite power series spaces [4].

Dealing with the backward weighted shift operators (derivation operators) we study a subclass of Sheffer sequences denominated Appell sequences, that contains relevant sequences such as the Laguerre, the Hermite, the Bernoulli and the Abel polynomials. Using methods of the so-called umbral calculus [5] and the theory of Köthe sequence spaces, we give necessary and sufficient conditions for an Appell sequence to be a basis.