We formulate a nonrecursive combinatorial rule for the expansion of the stable Grothendieck polynomials of [Fomin-Kirillov '94] in the basis of stable Grothendieck polynomials for partitions. This gives a common generalization, as well as new proofs of the rule of [Fomin-Greene '98] for the expansion of the stable Schubert polynomials into Schur polynomials, and the $K$-theoretic Grassmannian Littlewood-Richardson rule of [Buch '02]. Our main technique is Hecke insertion, a generalization of the tableau insertion algorithms of [Robinson '38] and [Schensted '61], and of [Edelman-Greene '84].

Our results are applied to prove a number of new formulas and properties for $K$-theoretic quiver polynomials, and the Grothendieck polynomials of [Lascoux-Schützenberger '82]. In particular, we provide the first $K$-theoretic analogue of the factor sequence formula of [Buch-Fulton '99] for the cohomological quiver polynomials. These applications will be discussed in Anders Buch’s talk.

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