On Shirshov bases of graded algebras

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There is a known result in the theory of PI algebras (i.e. associative algebras satisfying a nontrivial polynomial identity) saying that if an algebra is graded by a finite group, and the neutral component of the grading is PI, then the whole algebra is PI. We will present a similar result, where the property of being PI is replaced by a (weaker) property to have a Shirshov base, as in the celebrated Shirshov's height theorem. The proof is based on a simple combinatorial lemma from group theory. This is a joint work with Fedor Petrov (St. Petersburg).