In this paper the author gives an explicit description of the crystal base $\mathcal{B}(\infty)$ of the negative part of the quantized universal enveloping algebra of a finite-dimensional simple Lie algebra of type $B$, $C$, $D$, or $G_2$ in terms of extended Nakajima monomials. In a previous paper [Nagoya J. Math. 188, 31–57 (2007)] the author already obtained a similar result for type $A$. The proof (which in all details is only given for the most complicated case $G_2$) uses the description of $\mathcal{B}(\infty)$ in terms of Young tableaux established earlier by Jin Hong and the author [Young tableaux and crystal $\mathcal{B}(\infty)$ for finite simple Lie algebras, arXiv:math.QA/0507448v1].