

Stabilization Effects of Nonstandard Nitrogenous Bases in Transfer RNA

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Transfer RNA (tRNA) is essential in the process of translation, in which information in the genetic code is used to synthesize proteins. The bases in the anticodon region of tRNA have been shown to form an unusual stair-stepped conformation. Naturally occurring nonstandard bases are often found in the 34th and 37th positions of this region and are thought to provide thermodynamic stability. The stability effects of nonstandard bases in the anticodon region were investigated using density functional theory, at the M05-2X/6-31+G(d,p) level. Natural bond order (NBO) analysis was employed to examine the origin of favorable interactions within the tRNA nonstandard bases in the 37th position. Several interactions were found which may provide insight into the stabilizing interactions within the anticodon region. The results of this study will provide a better understanding of the molecular orbital stabilization of nonstandard bases in the 37th position of tRNA.

