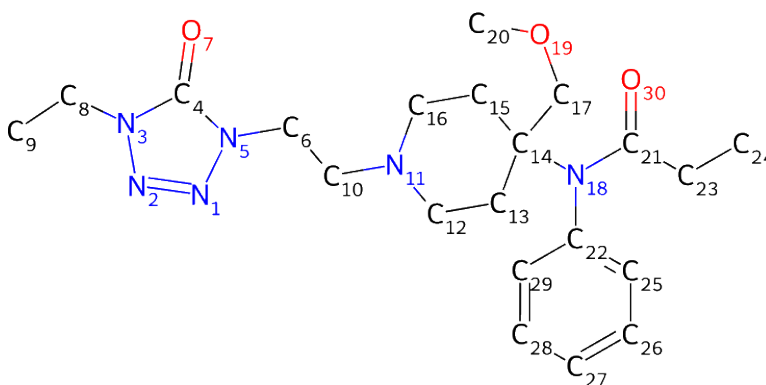


C-oxidation BDE Energy Report for: 043_alfentanil-out

This report covers the results for bond dissociation enthalpies (BDE) and solvent accessible surface area (SASA) calculations performed for 043_alfentanil-out. Oxidation propensity is established using C-H BDE. The lower the C-H BDE values the higher the propensity for C-oxidation. Details for the density functional theory (DFT) calculations and overall workflow are explained at the end of this document.

BDE and SASA



Atom	BDE (kcal/mol)	Propensity	SASA (Å ²)
C6	93.03	Moderate	18.30
C8	91.2	Moderate	26.91
C9	103.21	Low	29.37
C10	88.94	Moderate	14.14
C12	89.37	Moderate	12.54
C13	98.82	Low	10.40
C15	97.46	Low	10.40
C16	86.97	High	12.42
C17	93.2	Moderate	5.38
C20	96.36	Low	30.74
C23	91.1	Moderate	16.06
C24	101.5	Low	28.63
C26	112.08	Low	34.55
C27	112.67	Low	35.76
C28	112.26	Low	35.01

C29	112.61	Low	11.59
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Missing Sites:

C25.

Risk Scale:



Calculation Details

Conformational search calculations were performed only for the base ground state molecule. The lowest energy conformer was selected to generate radicals and run optimization DFT calculations. DFT calculations were performed using Gaussian with B3LYP level of theory and 6-31G(d,p) basis set. The BDE protocol was adapted from: *Lienard, P., Gavartin, J., Boccardi, G., & Meunier, M. (2015). Predicting drug substances autoxidation. Pharmaceutical research, 32, 300-310.*