partial rate factor

The rate of substitution at one specific site in an aromatic compound relative to the rate of substitution at one position in benzene. For example, the partial rate factor $f^Z_p$ for para-substitution in a monosubstituted benzene $C_6H_5Z$ is related to the rate constants $k(C_6H_5Z)$ and $k(C_6H_6)$ for the total reaction (i.e. at all positions) of $C_6H_5Z$ and benzene, respectively, and $\% \text{ para}$ (the percentage para-substitution in the total product formed from $C_6H_5Z$) by the relation:

$$f^Z_p = \frac{6 \frac{k(C_6H_5Z)}{k(C_6H_6)} \% \text{ para}}{100}$$

Similarly for meta-substitution:

$$f^Z_m = \frac{6 \frac{k(C_6H_5Z)}{2k(C_6H_6)} \% \text{ meta}}{100}$$

(The symbols $p^Z_f$, $m^Z_f$, $o^Z_f$ are also in use.) The term applies equally to the ipso position, and it can be extended to other substituted substrates undergoing parallel reactions at different sites with the same reagent according to the same rate law.

See also: selectivity

Source:
PAC, 1994, 66, 1077 (Glossary of terms used in physical organic chemistry (IUPAC Recommendations 1994)) on page 1149