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Chapter 1

Introduction

1.1. Preliminary

Salts, that are neutral when pure, such as the table salt sodium chloride $NaCl$, can dissociate (i.e. "electrolyse") into ions Na^{+1} and Cl^{-1} when dissolved in a strong dielectric solvents (such as water) — i.e. forming an aqueous electrolyte solution.



Na^{+1} and Cl^{-1} are ions that have either a positive charge (called cations) or a negative charge (anions). Cl^{-1} is a chlorine atom with one added extra electron (electron carries one negative charge, at $-1.609E-19$ Coulomb) while Na^{+1} is the sodium atom which has lost an electron (thus with a positive charge: $+1.609E-19$ Coulomb). The valence is the number z of electrons lost ($+z$) or gained ($-z$). The valence of Na^{+1} is plus one (losing one electron), while that of Cl^{-1} is minus one (gaining one electron). For the salt Na_2SO_4 , sodium ion Na^{+1} has valence again of plus 1, while SO_4^{-2} has valence of minus two. Therefore we have the valence types of salts based on the resulting valences of the ions. $NaCl$ is the type 1-1 electrolyte (namely, valence 1 for cation and valence -1 for anion), while Na_2SO_4 is type 1-2 electrolyte (valence = 1 for cation and valence = -2 for anion). We use the symbols z_+ or z_- to denote the valences of the cation and anion, respectively. The dissociation Eq. (1.1.1) is a chemical reaction. All rules for chemical reactions apply equally to the case of electrolysis. For any salt CA (C = cation and A = anion), the dissociation chemical equilibrium is written as

