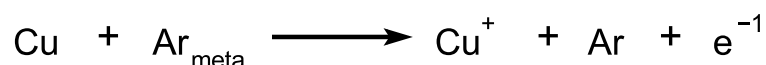


Penning gas mixture

A Penning gas mixture consists of a rare gas containing impurity atoms possibly at very low concentrations. The impurity atoms have an ionization potential V_{ion} which is lower than or equal to the metastable potential (V_{meta}) of the parent noble gas. The Penning effect in a Penning gas mixture is the ionization by charge transfer (charge exchange) during collision between a metastable atom and a neutral atom which decreases the average energy to form an ion pair, e.g.



In a glow discharge, this results in an increase of the the ionization coefficient (Townsend first coefficient), a decrease in breakdown potential and a lowering of the cathode fall potential. The magnetic Penning effect describes the increase of the ionization probability of gas in a low pressure electrical discharge resulting from the helical (spiral) movement of electrons in a magnetic field placed normal to the anode-cathode electrical field.

Source:

Orange Book, p. 148