**Collisions**

Wijnand proposed seven possible collisions between plasma and background gas species for a single metal oxide target with formula . For an oxide target with two metals and general formula there are twelve possible collisions: (1-3) for collisions between either one of the atoms in the plume and stationary background particles, (4-6) for the collisions of the plume atoms with high energy propagating background particles, (7) , (8) , (9) , for two identical particles within the plasma, (10) for collisions between the two metal atoms, and finally (11, 12) for collisions between the metal atoms and the oxygen atoms originating from the target. As result of an inelastic collision an oxidation reaction can occur, introducing new plume species with formulas , which increases the number of collision terms.

The initial velocity distribution separates identical particles in space, which means collisions between identical particles are relatively rare. When two identical particles with different velocities, traveling in the same direction, collide elastically, their velocities interchange. This results in a zero-net change in the plasma particle velocity distribution. Therefore, identical particle collisions are neglected.

If the two metal atoms are of similar mass (e.g. ), their initial average velocities will be close to each other. In this case the cross term is expected to be large. If the masses of the two metals vary greatly (e.g. ), their initial average velocities will be spaced apart, and consequently they will separate in space, resulting in a small collision term. However, if a significant amount of light metal atoms get slowed down by the background gas, the heavy metal atom might still collide with the light metal, which would again increase the significance of the collision term.