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ORAL PRESENTATION - Exploration of the metallic character of astatine

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Astatine 211 is considered to be one of the most promising candidates for targeted alpha therapy (TAT)^{1, 2} and it is the subject of a wide research program in Nantes (France).

Very few data on the chemistry of astatine (At) are available. On the one hand, At is a rare element and it has only short half-life radioactive isotopes. On the other hand, it is an “invisible” element: the amount of At-211 produced allows working at ultra trace concentrations (typically 10⁻¹¹ to 10⁻¹⁵ M) and no spectroscopic techniques can be used to estimate At characteristics at the molecular level. As a result, At chemistry is not well understood.

Based on these considerations, a research program has started in Nantes to explore the fundamental properties of At using a multi-disciplinary approach combining radiochemistry, analytical chemistry and molecular modelling competences. The object of this contribution is to present the main advances obtained during the last 8 years as regards especially to the particular metallic character of astatine. The methodology enabled us to define a Pourbaix diagram (Eh/pH diagram) for At in non-complexing acidic aqueous medium. We showed the existence of At⁻, and two stable At⁺ and AtO⁺ metallic forms of astatine.^{3, 4} This highlighted the metallic character of At by comparison with others halogens, as it was already proposed in the 60's.⁵ Our recent results on the chemical reactivity of AtO⁺ demonstrate the potentiality to form both coordination and covalent bonds with organic and inorganic ligands.^{6, 7}

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