

From Matrix-Isolation Spectroscopy to Preparative Chemistry: The world of Halogenated Species

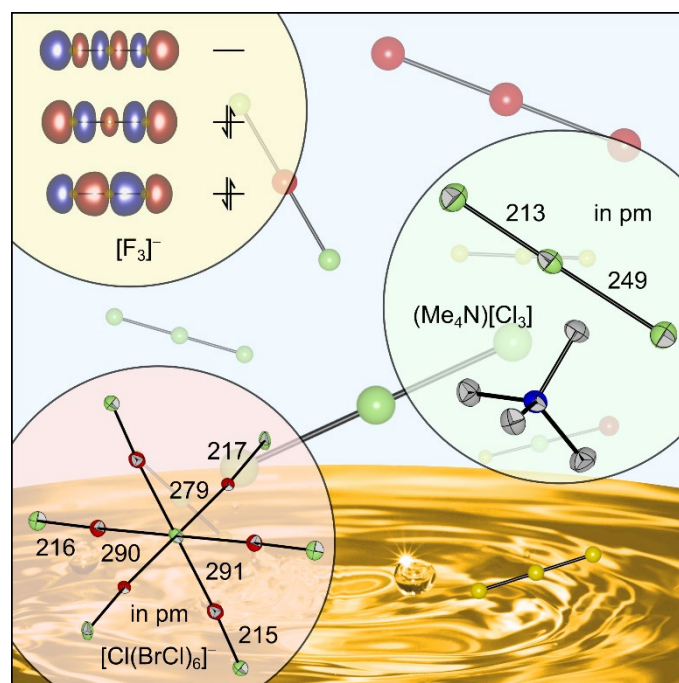
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In the recent years several polyhalogen- and polyinterhalogen-anions have been investigated under cryogenic conditions using matrix-isolation spectroscopy.¹ A powerful method to prepare such ionic species is the pulsed salt laser-ablation technique.²

In this context the formation of several free polyhalides like $[F_3]^-$, $[Cl_3]^-$ could be characterized under cryogenic conditions in rare-gas matrices. Thereby the matrix environment is a crucial factor as shown by theoretical modeling of the interaction between rare-gas matrices and a trifluoride guest anion.³ Beyond these free ions, new techniques have been developed to prepare ion-paired complexes like $M[AuF_4]$ under matrix-isolation conditions.⁴

Based on these investigations novel synthetic strategies have been developed to prepare such species also in bulk quantities which can now be used as chlorine storage materials and afterwards applied in industrial processes like the phosgene production.⁵



¹ Sonnenberg, K.; Mann, L.; Redeker, F. A.; Schmidt, B.; Riedel, S. Poly- and Interhalogen Anions from Fluorine to Iodine. *Angew. Chem. Int. Ed.* **2020**, *59*, 5464.

² Redeker, F. A.; Beckers, H.; Riedel, S. Investigation of Alkali Metal Polyfluorides by Matrix-Isolation Spectroscopy. *RSC Adv.* **2015**, *5*, 106568.

³ Bader, F.; Riedel, S.; Beckers, H.; Müller, C.; Tremblay, J. C.; Paulus, B. The peculiar interaction of trifluoride anions with cryogenic rare gas matrices. *J. Phys. Chem. A* **2021**, *125*, 6221.

⁴ Redeker, F. A.; Ellwanger, M.; Beckers, H.; Riedel, S. Investigation of Molecular Alkali Tetrafluorido Aurates by Matrix-Isolation Spectroscopy. *Chem. Eur. J.* **2019**, *25*, 15059.

⁵ Voßnacker, P.; Wüst, A.; Keilhack, T.; Müller, C.; Steinhauer, S.; Beckers, H.; Yogendra, S.; Schiesser, Y.; Weber, R.; Reimann, M.; Müller, R.; Kaupp, M.; Riedel, S. Novel Synthetic Pathway for the Production of Phosgene. *Science Advances* **2021**, *7*, 40: eabj5186