

A Highly Sterically Encumbered Boron Lewis Acid Enabled by an Organotellurium-Based Ligand

Daniel Wegener,^[a] Alberto Pérez-Bitrián,^[a, b] Niklas Limberg,^[a] Anja Wiesner,^[a] Kurt F. Hoffmann,^[a] and Sebastian Riedel^{*[a]}

Lewis acidic boron compounds are ubiquitous in chemistry due to their numerous applications, yet tuning and optimizing their properties towards different purposes is still a challenging field of research. In this work, the boron-based Lewis acid B[OTeF₃(C₆F₅)₂]₃ was synthesized by reaction of the teflate derivative HOTeF₃(C₆F₅)₂ with BCl₃ or BCl₃·SMe₂. This new compound presents a remarkably high thermal stability up to 300 °C, as well as one of the most sterically encumbered boron centres known in the literature. Theoretical and experimental

methods revealed that B[OTeF₃(C₆F₅)₂]₃ exhibits a comparable Lewis acidity to that of the well-known B(C₆F₅)₃. The affinity of B[OTeF₃(C₆F₅)₂]₃ towards pyridine was accessed by Isothermal Titration Calorimetry (ITC) and compared to that of B(OTeF₃)₃ and B(C₆F₅)₃. The ligand-transfer reactivity of this new boron compound towards different fluorides was demonstrated by the formation of an anionic Au(III) complex and a hypervalent iodine(III) species.

Introduction

Boron-based Lewis acids offer a plethora of applications in organic and organometallic chemistry.^[1] One of the most prominent examples of a boron-based Lewis acid is tris(pentafluorophenyl)borane (B(C₆F₅)₃, 'BCF'), which combines a high Lewis acidity with a high steric demand.^[2] Among its applications, it is a well-known activator of metallocene-based polymerization catalysts, as well as a popular catalyst in organic synthesis.^[3] Moreover, its high steric demand has made it especially famous in frustrated Lewis pair (FLP) chemistry, activating various small molecules in the presence of bulky bases.^[4] Therefore, the modification of BCF pointing to an even higher Lewis acidity and steric demand at the boron centre has always been a fruitful field of research.^[5,6] Moreover, to further adjust the Lewis acidity of the boron centre, the addition of a highly electronegative oxygen spacer between the B and the C atoms has been shown to be a suitable strategy and,

accordingly, B(OC₆F₅)₃ arises as a harder Lewis acid compared to BCF.^[7,8]

Another O-donor ligand that usually enables the formation of especially strong Lewis acids is the pentafluoroorothellurate group (teflate, –OTeF₃).^[9] In fact, B(OTeF₃)₃ can be considered as a Lewis superacid, as its Fluoride Ion Affinity (FIA) of 506 kJ mol^{−1} exceeds that of SbF₅ (496 kJ mol^{−1}).^[10,11] Since the discovery of B(OTeF₃)₃ in 1973,^[12] its main application has been as a teflate transfer reagent towards fluoride-containing compounds for the synthesis of a variety of different teflate species.^[9,13] Although the teflate group is often considered as a bulky analogue of fluoride,^[9,13,14] the steric demand caused by this moiety is less compared to other usual O- or N-donor ligands like –OC₄F₉, –N(C₆F₅)₂, or –OC(C₆F₅)₃.^[15] Nevertheless, the incorporation of these ligands to a boron centre has only been synthetically realized in the Lewis acid B(OC₄F₉)₃.^[16]

We have recently designed and synthesized teflate derivatives containing aryl groups, namely [*cis*-PhTeF₄O][−] and [*trans*-(C₆F₅)₂TeF₃O][−] (from now on simplified as –OTeF₃(C₆F₅)₂).^[17] These groups are stable to moisture and air, contrary to the teflate ligand, and might additionally provide a huge steric shielding to the acidic centre to which they are bonded due to the presence of the aryl groups. The outstanding properties of the pentafluorophenyl derivative, which comprise a higher Brønsted acidity and robustness against fluoride abstraction compared to the phenyl analogue, prompted us to employ it for the synthesis of Lewis acids. Herein we report on the preparation of the sterically encumbered Lewis acid B[OTeF₃(C₆F₅)₂]₃, the evaluation of its Lewis acidity and steric profile, as well as its reactivity as an OTeF₃(C₆F₅)₂ group transfer reagent.

Results and Discussion

The recently reported synthesis of the acid HOTeF₃(C₆F₅)₂ (1) requires the use of anhydrous HF in the final protonation step

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of the protocol,^[17] which made us seek for a more convenient alternative. Gratifyingly, when the starting material *trans*-(C₆F₅)₂TeF₄ is stirred overnight at room temperature in an acetonitrile/water mixture (15% v/v H₂O in MeCN), a selective hydrolysis of one Te–F bond can be achieved and HOTeF₃(C₆F₅)₂ (**1**) can be isolated in very good yield (86%).

In order to demonstrate the reactivity of **1** in protonation reactions, it was reacted with [PPh₄]Cl to form [PPh₄][OTeF₃(C₆F₅)₂] (**2**) upon release of gaseous HCl (Figure 1). The ¹⁹F NMR spectrum shows the typical pattern for this kind of compounds. The two chemically distinct environments for the F atoms bonded to the Te centre lead to a triplet of quintets (δ = 9.9 ppm) and a doublet of quintets (δ = –25.2 ppm), respec-

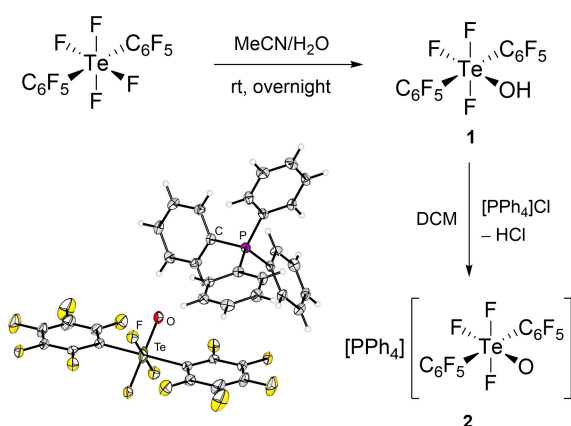


Figure 1. Improved synthesis of compound HOTeF₃(C₆F₅)₂ (**1**) and reaction with [PPh₄]Cl to form [PPh₄][OTeF₃(C₆F₅)₂] (**2**) in the solid state. Displacement ellipsoids set at 50% probability. For crystallographic details see Supporting Information.

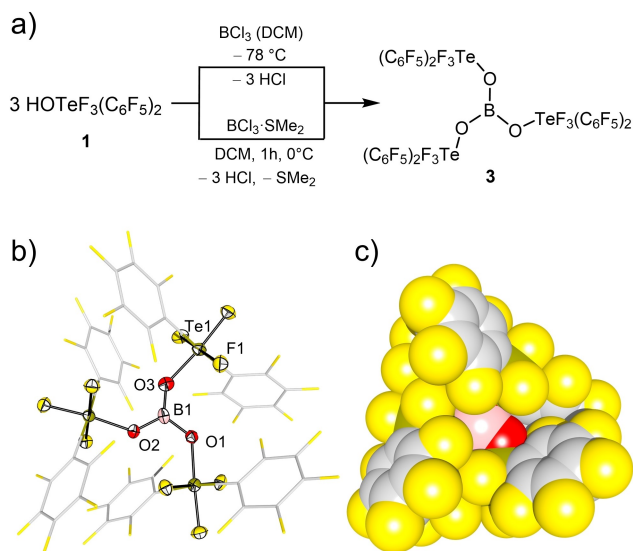


Figure 2. a) Different pathways for the synthesis of B[OTeF₃(C₆F₅)₂]₃ (**3**). b) Molecular structure of **3** in the solid state. For clarity, perfluorophenyl substituents are shown as wireframes and co-crystallized toluene molecules are omitted. Displacement ellipsoids set at 50% probability. Selected bond lengths [pm] and angles [°]: B1–O1 140.8(9), B1–O2 130.0(8), B1–O3 137.1(8), O1–B1–O2 122.5(8), O1–B1–O3 116.2(8), O2–B1–O3 121.2(9). For crystallographic details see Supporting Information. c) Space-filling representation of **3**.

tively, with an integral ratio of 1:2. The resonances of the fluorine atoms of the rings can be observed at –127.8 ppm (F_o), –148.1 ppm (F_p), and –160.3 ppm (F_m). Single crystals of **2** grew via slow evaporation of a dichloromethane solution under air. In the solid state, there is a negligible interaction between the ions, and the anion shows a slightly distorted octahedral geometry at the Te centre (Figure 1). This is in contrast to the previously reported K[OTeF₃(C₆F₅)₂]·MeCN, in which the cation-anion interaction is considerably stronger.^[17]

With this reactivity in hand, we explored the possibility of transferring the OTeF₃(C₆F₅)₂ ligand to a boron centre in a similar fashion in order to prepare a Lewis acid. In fact, the reaction of BCl₃ with three equivalents of **1** in dichloromethane at –78 °C yields the Lewis acid B[OTeF₃(C₆F₅)₂]₃ (**3**) quantitatively under formation of three equivalents of HCl (Figure 2a). It is also possible to use the adduct BCl₃·SMe₂ as a starting material and perform the reaction at 0 °C, in which additionally SMe₂ is released, leading to the adduct-free Lewis acid **3**. This experiment underlines the superior robustness against fluoride abstraction of the OTeF₃(C₆F₅)₂ ligand,^[17] since the reaction of BCl₃·SMe₂ with *cis*-PhTeF₄OH only leads to the formation of [BF₄][–] and other decomposition products, without Lewis acid formation. Interestingly, B[OTeF₃(C₆F₅)₂]₃ (**3**) shows an unusually high thermal stability up to 300 °C, which is remarkable in comparison to B(OTeF₅)₃ (**4**), which decomposes at 140 °C,^[12] or B(OCF₃)₃, decomposing already at –20 °C through a β-fluoride elimination.^[18]

The formation of the Lewis acid **3** can be confirmed by NMR spectroscopy. The ¹⁹F NMR spectrum shows a triplet of quintets at –8.0 ppm, which is high-field shifted by approx. 11 ppm, compared to the corresponding signal of acid **1** (δ = 3.0 ppm), and a doublet of quintets at –24.0 ppm. Besides, the coupling constant between these fluorine atoms directly bonded to the tellurium centre decreases from ²J(¹⁹F, ¹⁹F) = 55 Hz to 44 Hz. The ¹¹B NMR spectrum reveals a broad resonance at 13.5 ppm, which is in agreement with related literature-known B(OR)₃ compounds.^[7]

Moreover, single crystals of the Lewis acid suitable for X-ray diffraction were grown by slow diffusion of *n*-pentane into a toluene solution of **3** at –24 °C (Figure 2b). The geometry at the B centre is distorted trigonal planar, with O–B–O angles of approx. 120°. The B–O bond lengths (130.0(8) to 140.8(9) pm) are in the same range as in B(OTeF₅)₃ (135.8 pm).^[19] The structure reveals a variation of the conformation of the aromatic rings in the ligands. In two of them, the rings are almost orthogonal, as evidenced by the angle between the planes of the two rings (79.8° and 86.3°, respectively), whereas in the third ligand the rings are almost coplanar (7.8°). The high steric demand of the ligands might account for this special conformation, which is further supported by interactions of the perfluorinated rings with co-crystallized toluene molecules in the solid state (see Figure S30).

The presence of such bulky ligands provides a great steric protection at the B centre, as it is visualized in the space-filling model of **3** (Figure 2c). To further analyze the steric encumbrance created by our ligand, the steric profile of the Lewis acid **3** was determined following the method recently proposed by

Finze and Radius.^[15] This way, the % buried volume of the fluoride adduct of **3** was calculated with the SambVca 2.1 tool^[20] to be 81.1%. This entails a much larger steric hindrance at the boron centre than that caused by the related OTeF_5 group in **4** ($\%V_{\text{bur}}=66.3\%$) or the C_6F_5 substituents in BCF ($\%V_{\text{bur}}=58.9\%$). In general, the $\text{OTeF}_3(\text{C}_6\text{F}_5)_2$ ligand is unique in terms of sterics, providing one of the highest steric demands at boron centres when compared to recent literature work (Figure 3a).^[15]

To determine the Lewis acidity of $\text{B}[\text{OTeF}_3(\text{C}_6\text{F}_5)_2]_3$, we performed different theoretical analyses and benchmarked them against a set of strong boron-based Lewis acids (Figure 3b). First, the gas phase FIAs were calculated on the BP86-D3BJ/def2-SVP level of theory,^[21] using the $\text{Me}_3\text{SiF}/\text{Me}_3\text{Si}^+$ system as the anchor point.^[10] Compound **3** is a strong Lewis acid with a calculated FIA value of 463 kJ mol^{-1} . This value surpasses that of $\text{B}(\text{OC}_4\text{F}_9)_3$ (437 kJ mol^{-1}) and that of $\text{B}(\text{C}_6\text{F}_5)_3$ (454 kJ mol^{-1}), approaching the threshold for Lewis superacidity given by SbF_5 (487 kJ mol^{-1}). In comparison to the closely related $\text{B}(\text{OTeF}_5)_3$ (**4**) the FIA value of **3** is reduced, but it is still around 85% of the value of **4** (537 kJ mol^{-1}). In addition, the Global Electrophilicity Index (GEI), calculated by applying the HOMO and LUMO energies,^[22] was used. Contrary to the FIA, which is a global method according to the classification by Greb,^[23] the GEI is an electron affinity measurement and can be considered as an intrinsic Lewis acidity estimation, independent of any influence upon adduct formation. The LUMO energy of $\text{B}[\text{OTeF}_3(\text{C}_6\text{F}_5)_2]_3$ (**3**) was calculated to be -4.73 eV , whereas the LUMO of $\text{B}(\text{OTeF}_5)_3$ (**4**) is located at a lower energy (-6.42 eV), already indicating a higher Lewis acidity of the latter. A similar trend is observed for the GEI (8.22 vs. 9.76).

Experimentally, the Lewis acidity of $\text{B}[\text{OTeF}_3(\text{C}_6\text{F}_5)_2]_3$ (**3**) was first assessed by the Gutmann-Beckett method, which relies on the chemical shift variation of the ^{31}P NMR signal of OPeEt_3 upon

adduct formation, $\Delta\delta_p$.^[24] In fact, the ^{31}P NMR spectrum of $\text{B}[\text{OTeF}_3(\text{C}_6\text{F}_5)_2]_3 \cdot \text{OPeEt}_3$ (**3**·**OPeEt**₃) shows a signal at 78.2 ppm, and therefore a value of $\Delta\delta_p=25.3 \text{ ppm}$, this being comparable with the shift caused by BCF ($\Delta\delta_p=26.5 \text{ ppm}$).^[5] For the sake of comparison, we applied this method to the closely related $\text{B}(\text{OTeF}_5)_3$ (**4**) and observed a $\Delta\delta_p=31.8 \text{ ppm}$ for the $\text{B}(\text{OTeF}_5)_3 \cdot \text{OPeEt}_3$ adduct (**4**·**OPeEt**₃). This compound was additionally analyzed by single crystal X-ray diffraction, showing the expected tetrahedrally coordinated boron centre (see Figure S32). These values confirm the trend described by our theoretical analysis (*vide supra*). All our estimations point to a slight decrease in the Lewis acidity when two F atoms in the OTeF_5 ligands in $\text{B}(\text{OTeF}_5)_3$ are formally substituted by C_6F_5 groups.

The blue-shift of the CN stretching vibration in CD_3CN upon coordination to a Lewis acid, $\Delta\nu(\text{CN})$, is also an established parameter to estimate Lewis acidity.^[23] When $\text{B}[\text{OTeF}_3(\text{C}_6\text{F}_5)_2]_3$ (**3**) is dissolved in DCM and CD_3CN is added, adduct formation can be confirmed by ^{11}B NMR spectroscopy, as the signal shifts to -0.64 ppm indicating a change from the three-coordinate B in **3** to a four-coordinate boron species, namely $\text{B}[\text{OTeF}_3(\text{C}_6\text{F}_5)_2]_3 \cdot \text{CD}_3\text{CN}$ (**3**·**CD**₃**CN**). The CN stretching vibration is blue shifted by 20 cm^{-1} , which is a significant lower value in comparison to that of the CD_3CN adduct of the related $\text{B}(\text{OTeF}_5)_3$ (**4**·**CD**₃**CN**, $\Delta\nu=103 \text{ cm}^{-1}$, Figure S25) or that of BCF.^[25] This reveals a much weaker adduct formation in the case of our Lewis acid **3**, as confirmed also by the fact that CD_3CN can be easily removed from **3**·**CD**₃**CN** by evaporation.

In contrast, the Lewis acid **3** forms a stable adduct with the stronger Lewis base pyridine (Figure 4a), as confirmed by NMR spectroscopy (see Figures S16 and S17) and single-crystal X-ray diffraction (Figure 4b). The molecular structure in the solid state of $\text{B}[\text{OTeF}_3(\text{C}_6\text{F}_5)_2]_3 \cdot \text{NC}_5\text{H}_5$ (**3**·**NC**₅**H**₅) reveals a tetrahedrally coordinated boron centre, with a B–N bond length of $163.1(5) \text{ pm}$ being in the typical range for a classical Lewis acid-base adduct.^[26] To determine experimentally the affinity of **3** towards pyridine in comparison to $\text{B}(\text{OTeF}_5)_3$ we applied Isothermal Titration Calorimetry (ITC). This method furnishes the equilibrium constants as well as the enthalpy ΔH of the reaction of a Lewis acid with a Lewis base, as demonstrated in the literature with a collection of triarylboranes and N, O, S and P bases.^[27] Our ITC measurements (*o*-difluorobenzene, 30°C) reveal an affinity constant K_A of $(1.23 \pm 0.16) \cdot 10^4$ for the reaction of $\text{B}[\text{OTeF}_3(\text{C}_6\text{F}_5)_2]_3$ with pyridine (Figure 4c), whereas a higher affinity is observed for $\text{B}(\text{OTeF}_5)_3$ ($K_A=(1.69 \pm 0.13) \cdot 10^5$, Figure S28). The obtained enthalpies ΔH of the association reaction show a similar trend (-41 kJ mol^{-1} vs. -89 kJ mol^{-1}) and were additionally calculated (see Table S1). These results are in accordance with the moderately lower Lewis acidity of $\text{B}[\text{OTeF}_3(\text{C}_6\text{F}_5)_2]_3$ compared to $\text{B}(\text{OTeF}_5)_3$ (*vide supra*). Furthermore, the affinity of $\text{B}(\text{C}_6\text{F}_5)_3$ ($K_A=(1.34 \pm 0.29) \cdot 10^5$, Figure S29) towards pyridine is found to be similar to that of $\text{B}(\text{OTeF}_5)_3$, which is in agreement with the comparable blue-shift of the $\Delta\nu(\text{CN})$ obtained upon coordination of CD_3CN .

As previously mentioned, $\text{B}(\text{OTeF}_5)_3$ offers ligand transfer reactivity, which has enabled the synthesis of numerous teflate-containing species,^[9,13] the driving force of the process being

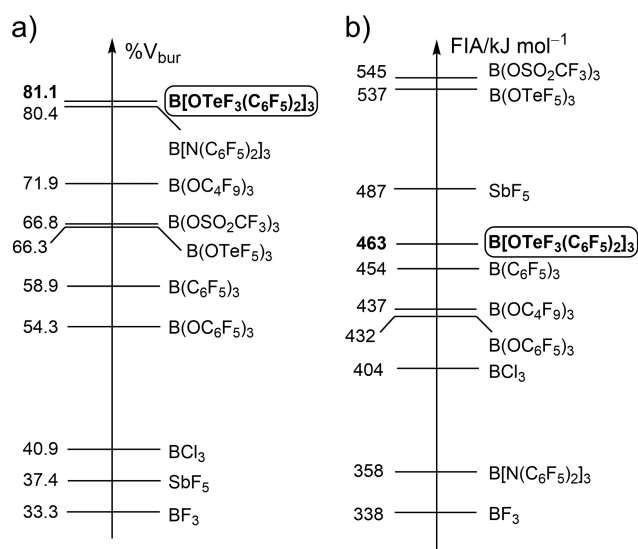


Figure 3. a) Buried volumes ($\%V_{\text{bur}}$ of the Lewis acid fluoride adduct), determined by the method of Radius and Finze.^[15] b) Fluoride Ion Affinities (FIAs) of selected Lewis acids. Calculations performed on BP86-D3BJ/def2-SVP level of theory. Isodesmic reactions with $\text{Me}_3\text{SiF}/\text{Me}_3\text{Si}^+$ as anchor were used.

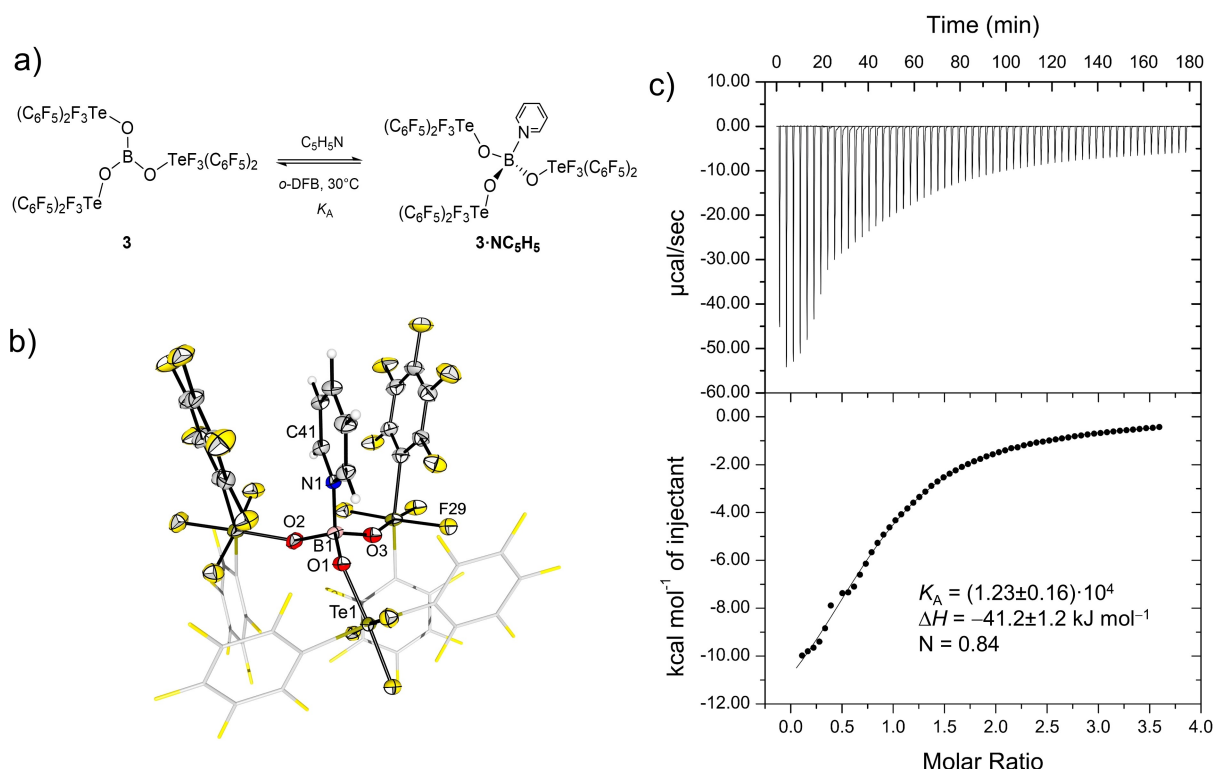


Figure 4. a) Formation of the adduct $B[OTeF_3(C_6F_5)_2]_3 \cdot NC_5H_5$ (**3**·**NC₅H₅**). b) Molecular structure in the solid state of **3**·**NC₅H₅**. For clarity, some perfluorophenyl substituents are shown as wireframes and co-crystallized toluene molecules are omitted. Only one set of distorted atoms found in the ligand containing Te1 is shown. Displacement ellipsoids set at 50% probability. Selected bond lengths [pm] and angles [°]: B1–O1 144.7(5), B1–O2 144.5(5), B1–O3 144.9(5), B1–N1 163.1(5), O1–B1–O2 112.5(3), O1–B1–O3 109.8(3), O2–B1–O3 112.7(3), O1–B1–N1 103.5(3), O2–B1–N1 109.4(3), O3–B1–N1 108.4(3). For crystallographic details see Supporting Information. c) Isothermal Titration Calorimetry (ITC) measurement (o-difluorobenzene, 30 °C) of the adduct formation described in a). K_A is the affinity constant, ΔH is the enthalpy of the reaction and N is the ratio of Lewis acid and base.

the formation of BF_3 or $[BF_4]^-$. This prompted us to explore the ability of compound **3** to react as a transfer reagent of the $OTeF_3(C_6F_5)_2$ group towards fluoride compounds (Figure 5). In fact, if the Lewis acid **3** is exposed to four equivalents of $[NMe_4]F$, which acts as a free fluoride source, rapid formation of $[BF_4]^-$ and the free anion $[OTeF_3(C_6F_5)_2]^-$ are observed in the ^{19}F NMR spectrum. Compound $[NMe_4][OTeF_3(C_6F_5)_2]$ (**5**) could be also crystallized, showing well separated anions and cations in the solid state (Figure 5), similarly to the case of the $[PPh_4]^+$ salt **2**. To further investigate the reactivity of **3**, a transition-metal complex and a main group compound containing labile fluoride ligands were selected. As a transition-metal complex, $[PPh_4][[(CF_3)_3AuF]]$ was chosen,^[28] which reacts with **3** to form $[PPh_4][[(CF_3)_3Au(OTeF_3(C_6F_5)_2)]]$ (**6**). The compound was characterized by ^{19}F NMR spectroscopy, where the typical pattern of the $OTeF_3(C_6F_5)_2$ group and the characteristic septet ($\delta = -27.4$ ppm, $^4J(^{19}F, ^{19}F) = 6$ Hz) and quartet ($\delta = -38.1$ ppm) of the $Au(CF_3)_3$ fragment are observed, as well as by ESI-MS ($[(CF_3)_3Au(OTeF_3(C_6F_5)_2)]^-$: $m/z = 940.8$). Furthermore, it was possible to crystallize this Au(III) species via slow diffusion of *n*-pentane into a dichloromethane solution of **6** (Figure 5). The gold(III) centre possesses the typical square-planar coordination with an Au–O bond distance (209.5(4) ppm) comparable to that found in $[(CF_3)_3Au(ONO_2)]^-$ (209.0(4) ppm).^[29] Interestingly, the

arene rings in the ligand remain almost coplanar (angle between the planes of the rings is 6.71°).

A hypervalent fluoroiodane compound^[30] was additionally selected because of the interest of I(III) compounds for electrophilic transfer reactions, among which the Togni reagents^[31] have emerged as versatile trifluoromethylation tools.^[32] The successful transfer of the $OTeF_3(C_6F_5)_2$ ligand by the use of **3** was verified by NMR spectroscopy, as the signals of the starting material vanished. The new I(III) compound **7** could be isolated as a white solid and was characterized by NMR spectroscopy (see SI for details) and its molecular structure in the solid state was determined by X-ray diffraction. The structure shows the $OTeF_3(C_6F_5)_2$ ligand bonded to the iodine centre, further confirming the transfer of the moiety. Similarly to compound **6**, the C_6F_5 rings are almost coplanar with an angle of 8.30° to each other (Figure 5).

Conclusions

In summary, we have introduced the new boron-based Lewis acid $B[OTeF_3(C_6F_5)_2]_3$ (**3**), which was easily synthesized from BCl_3 or $BCl_3 \cdot SMe_2$ and $HOTeF_3(C_6F_5)_2$ (**1**). One of the remarkable properties of this Lewis acid is the especially high thermal stability up to 300 °C. Evaluation of the steric profile revealed

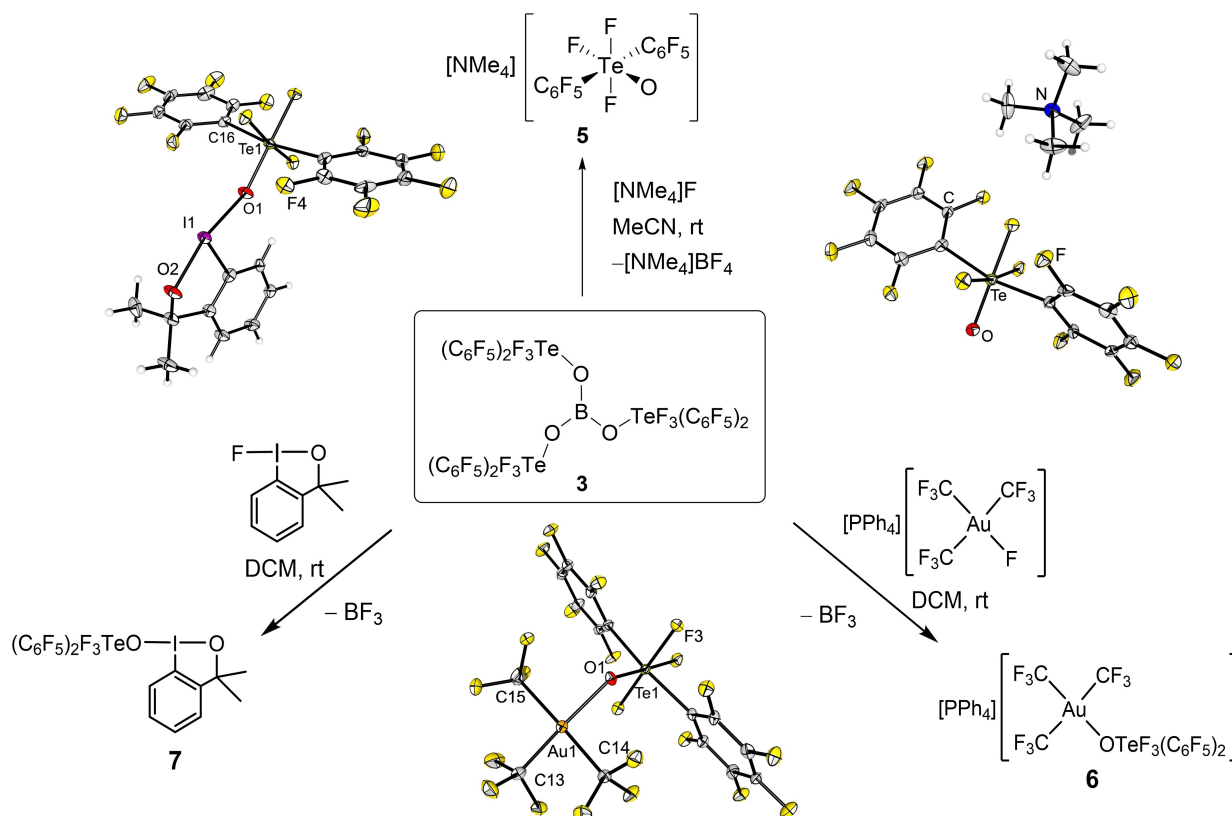


Figure 5. Reactivity of $\text{B}[\text{OTeF}_3(\text{C}_6\text{F}_5)_2]_3$ (**3**) as a transfer agent towards $[\text{NMe}_4]\text{F}$ and main group and transition metal fluoride compounds. Molecular structures in the solid state of the reaction products **5**, **6** and **7**. Displacement ellipsoids set at 50% probability. Selected bond lengths [pm] and angles $^\circ$: **7**: I1–O1 219.0(3), I1–O2 201.2(3), O2–I1–O1 164.9(2); **6**: Au1–O1 209.5(4), Au1–C15 209.2(5), Au1–C14 208.9(6), Au1–C13 201.8(6), C15–Au1–O1 90.4(2), C13–Au1–C15 90.5(2), C13–Au1–C14 90.0(2), C14–Au1–O1 89.9(2), C13–Au1–O1 174.4(2), C14–Au1–C15 172.5(2). For crystallographic details see Supporting Information.

that the $\text{OTeF}_3(\text{C}_6\text{F}_5)_2$ ligand causes one of the greatest steric encumbrances at a boron centre known in the literature. This is combined with a high Lewis acidity, which is comparable to that of $\text{B}(\text{C}_6\text{F}_5)_3$, and slightly lower than in the related $\text{B}(\text{OTeF}_5)_3$, as verified by theoretical (FIA, GEI) and experimental (Gutmann-Beckett, $\nu(\text{CN})$) methods. Estimation of the affinity of **3** towards pyridine by means of ITC revealed a lower affinity constant than that found for the related teflate species **4**, which itself is comparable to the value obtained for BCF. Moreover, the easy use of the new compound as a ligand transfer reagent was first demonstrated by reaction with $[\text{NMe}_4]\text{F}$ to form $[\text{NMe}_4][\text{OTeF}_3(\text{C}_6\text{F}_5)_2]$ (**5**). Starting from the corresponding fluoro derivative and following a related procedure, **3** was then used in the synthesis of the Au(III) species $[\text{PPh}_4][(\text{CF}_3)_3\text{Au}(\text{OTeF}_3(\text{C}_6\text{F}_5)_2)]$ (**6**), as well as in the preparation of the hyper-valent iodine Togni-type compound **7**. Due to the unique combination of high Lewis acidity and steric hindrance of $\text{B}[\text{OTeF}_3(\text{C}_6\text{F}_5)_2]_3$ (**3**), accompanied by the capability of group transfer, this new Lewis acid arises as a real alternative to well-established boron-based Lewis acids and might offer superior behaviour. Further studies for the application of this unprecedented compound, especially in FLP chemistry, are currently ongoing in our lab.

Author Contributions

D.W. planned and performed the experiments and quantum chemical calculations, collected, and interpreted spectroscopic data and wrote the manuscript. A.P.-B. helped with the interpretation of spectroscopic data and revised the manuscript. N.L., A.W. and K.F.H. collected XRD data and solved and refined the crystal structures. All authors commented on the manuscript. S.R. directed and coordinated the research and revised the manuscript.

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Conflict of Interests

The authors declare no conflict of interest.

Data Availability Statement

The data that support the findings of this study are available in the supplementary material of this article.

Keywords: Lewis acid • superbulky • isothermal titration calorimetry • boron • organotellurium

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