# **Bonding in Tetrahedral Tellurate**

# **(updated and expanded)**

This literature discussion is an expansion of a previous LO (https://www.ionicviper.org/literature-discussion/tetrahedral-tellurate) and based on a 2008 Inorganic Chemistry article <http://dx.doi.org/10.1021/ic701578p>

The full reference is:

["Tetrahedral Tellurate," S. Konaka, Y. Ozawa, and A. Yagasaki, *Inorg. Chem.* **2008**, *47*, 1244-1245.](http://dx.doi.org/10.1021/ic701578p)

Write out the answers to the following questions *before* class and bring them with you. You will turn this in at the end of class.

1. Explain in your own words the reason the compound highlighted in this paper was made. (Goal 1)
2. Identify at least three words that you don’t know the meaning of in this paper. Try to find the meaning of one of them (it can be a compound name, the name of a technique, etc). Kudos if you know them all! (Goal 6)
3. In what molar ratios are the reagents combined when making this substance? Are there any special conditions or equipment that would be required if you were to carry out this synthesis in the lab? (Goals 1 and 10)
4. To the best of your ability write a balanced reaction representing the synthesis of tellurate including an indication of the solvent(s) used over the arrow. Many chemical reactions have lots of unidentified byproducts which can make balancing the reactions challenging. (Goals 1 and 10)
5. What methods were used by the authors to confirm that they have prepared the compound? Look carefully both in the text and in the footnotes. For now, just list the methods, don’t worry about what they tell you. (Goals 1, 4, and 5)
6. Draw Lewis structures that obey the octet rule for TeO42-, SeO42-, IO4-, SO42-. For the tellurate, draw another Lewis structure using expanded octet for the central atom. (Goal 2)
7. Why was drawing the 4 Lewis structures in the previous question so easy after you drew the first one? (Goals 2 and 7)
8. Interpret the 125Te NMR spectrum by assigning the two signals at ~ 0 and ~600 ppm. Rationalize this shift by considering the electron donating ability of the ligands. (Goal 3)
9. Look at the Lewis structures you drew for the tellurate species - which one best matches the X-ray structure data reported in the paper? Explain your choice based on this data. (Goal 8)
10. Determine the point group of the TeO42- assuming all the Te-O bond lengths are the same and all the O-Te-O bond angles are the same. What about when bond lengths match those in the paper? (Goal 9)

1. Examine Figure 2. The dotted lines represent hydrogen bonding. Which two species are involved in all of the hydrogen bonds? (Goal 11)