

A CASE FOR TESTING

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A case for the environmental testing of barium and barium compounds now exists. This case is developed from the following sequences of events and reasoning:

1. Meteorological study.
2. An anonymous source of information stated to be reliable.
3. Chemistry analysis.
4. pH testing of rainwaters.
5. Physical sample collected in association with aircraft activity.
6. Testing of chemical hypothesis.
7. Solubility and equilibrium considerations.
8. Environmental testing : water, air, soil.

Each of these topics will now be discussed in greater detail.

1. Meteorological Study:

A reasonable case can be made, based upon meteorological considerations and observations, that an aerosol particle, especially of a salt nature, is regularly being introduced into the atmosphere as a direct result of the unidentified aircraft operations under consideration. The premise for this case begins with the meteorological studies of relative humidity at flight altitude begun in August of 1999 in Santa Fe, NM and continuing through the middle of the current year. These studies show the repeated and regular appearance of cirrus, cirro-stratus and cirro-cumulus cloud deck formations as a direct result of aircraft operations under conditions of extremely low relative humidity (avg. 30%). Historic meteorological observations coupled with reliable sources demonstrate that such cloud formations are not to be expected, except under the most unusual of conditions, unless the relative humidity (with respect to water, per convention and standard measurement) is greater than 70%. This contradiction is of the greatest significance, and the rapid, recent and extreme variation in environmental conditions and activity must be both explained and accounted for. Observations, on a continuous and sustained basis since the beginning of 1999, show aircraft as the source of the materials, having been clearly photographed, observed, and documented leaving persistent and continuous trails of an unidentified substance which transforms itself into the "cloud" formations under the stated conditions of extreme low relative humidity. The reliable sources referred to include Vincent Schaefer, inventor of cloud seeding in 1946, the United States Naval Postgraduate School in Monterey, CA, the contemporary textbook "Meteorology", by Joseph M. Moran, and a

recent study by both NOAA and NASA. Please refer to the relative humidity studies elsewhere on this site for further information on this topic.

In seeking an explanation for this variation, it is helpful to begin the consideration with the "unusual case" of cloud formation at relative humidity levels as low as 70%. It is stated by Schaefer and others that the most likely occurrence of such cloud formations is best exemplified along the coastline, where microscopic salt particles, or cloud nuclei, frequently exist. Such water-seeking nuclei are referred to as hygroscopic. Therefore, it is observed that the introduction of hygroscopic nuclei can alter the process of cloud formation to some degree, although it is seldom to never expected to be effective under relative humidity levels less than 70%. Most cloud formation, of any type, is the result of nuclei processes.

Next, it is beneficial to consider the models for cloud formation, especially cirrus cloud formation, to identify the most prominent variables that should be considered. Once such model is presented by Paul J. Demott, at the Department of Atmospheric Science at Colorado State University. This model deals specifically with laboratory studies of cirrus cloud processes. Although any laboratory model is by necessity a simplification of nature, it remains useful. The primary variables of the model are temperature, relative humidity, and aerosol size. Special attention should be given to this last variable mentioned.

Analysis of this model also results in an important conclusion: The smaller the size of the nuclei in the atmosphere, the greater the rate of cirrus cloud formation.

The objective at this stage of the analysis is to identify what process can be responsible for altering the tenets of conventional meteorology, and what will provide for repeated cloud formations under conditions of extremely low relative humidity. The suggestions given as a result of the above analysis are twofold: First, it is expected and anticipated that the material in question delivered from the aircraft is likely of a salt nature, and second, that it is of an extremely small size.

It is also observed that precipitation seldom accompanies the cirrus cloud formations that result from the aircraft delivery, and yet it is a fact that the "clouds" do form. Therefore, the expectation at this stage is that we are seeking a salt material, presumed to be extremely small (.e.g., micron, or sub-micron level quite possible), and that it possesses strong desiccating, or drying, properties. This latter quality would explain the apparent contradiction between the frequent appearance of "clouds" and the associated drought that we find the country to be currently undergoing. In short, the

introduction of massive amounts of hygroscopic aerosols is suspected as being one of the major constituents of this program.

2. An anonymous source of information stated to be reliable:

Information has been offered to the public by an anonymous source in the earlier portion of the year 2000. This source is simply stated to be reliable to the highest order, and it is stated that the identity of the source must be protected. This source states that the material being delivered by aircraft is composed of barium salts, and that it is being used in connection with advanced radar studies. No further information on this aspect of the research is available at this time.

3. Chemistry analysis:

If we postulate that the source of information referenced above is indeed reliable, it is worthwhile to investigate the implications of combining the information that has been presented. It is at least noteworthy to recognize that two independent sources each make the case of a salt material being used.

The next stage of this analysis requires an investigation into barium and barium compounds. I am not a chemist by profession, but the following information has been acquired:

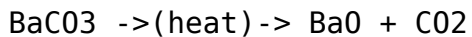
Barium occurs naturally in two primary forms, barium carbonate (BaCO_3) and barium sulfate (BaSO_4). The material is mined from the earth in these forms. Barium carbonate is commonly known as witherite, and significant deposits occur in both the United States and China. There are many other compounds of barium that can be developed chemically, but this analysis will start with the simplest case of that which can be mined in abundance and economically from the earth. Of these two forms of naturally occurring barium, greater attention has been devoted to barium carbonate for the following reasons:

1. If barium carbonate is subjected to significant heat, the combustion process results in the production of barium oxide and carbon dioxide. It should be mentioned that in all attempts to determine the actual source of emissions from the aircraft, even under telephoto conditions, the engines have never been eliminated from consideration and remain suspect. The fact that other delivery mechanisms have been observed and recorded does nothing to interfere with this claim.
2. Barium oxide is a whitish powder.
3. Barium oxide absorbs water, and is used as a desiccant for that reason.
4. Barium oxide induces respiratory distress, especially

bronchitis.

5. Barium sulfate does not possess these same properties, and is consequently of less interest at this time.

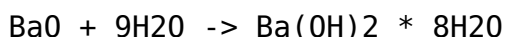
The first of 5 chemical reactions will therefore be presented. As I do not make any claim to being a chemist, any errors found quantitatively or in basic concept to these reactions will be appreciated.



The interesting properties of barium oxide (BaO) have been mentioned. They are especially interesting because they begin to satisfy the circumstances of meteorological observations and science, feasible methods of delivery, economics, and formation, consistent chemical attributes, correlation with observed patterns of dehydration in the atmosphere, conformal in appearance, and satisfies at least in part the observed and reported health affects upon the population.

It is not adequate to stop the investigation at this point. It is now necessary to devote more attention to the chemistry of barium oxide, and to learn what is expected if it were released into or formed within the atmosphere. I offer the following chemical equations as original work, which will be helpful to confirm or refute by anyone with further knowledge on this subject:

Barium oxide combines with water very aggressively. I have the reaction as:



The resulting compound from this reaction is termed barium hydrate, or barium hydroxide, octahydrate. Barium hydrate exists as a whitish powder or crystal form.

This reaction explains why barium oxide is used commercially as a desiccating, or drying agent. It would therefore be expected to extract the moisture out of the air. If produced at a sufficiently small size, this reaction goes a long way to explain the observed alterations in cloud formation under conditions of extremely low relative humidity. It would also be consistent with the laboratory model for cirrus cloud formation mentioned earlier, as well as with the anonymous declaration of barium salts. Barium oxide is indeed considered to be a salt, and it possesses a relatively high degree of solubility.

4. pH testing of rainwaters:

If we accept the previous set of events to be from a reasonable scenario, it is worthwhile to further attempt to validate the

ideas. One such method that can be used to assist in the process is the pH testing of rainwaters, i.e., the testing for acidity and alkalinity. This method is suggested because of the presence of the hydroxides in the reaction above, which indicates an expected alkalinity that presumably would affect the rainwaters.

Rainwater samples have been collected on 5 different occasions in the southern Santa Fe, NM area, and they have been tested for pH. It should be mentioned that collectable rainwater in the location mentioned has been an extremely rare event since before October of 1999 to the present day. Extreme drought is now characteristic of this location, and the city of Santa Fe itself is under the next to highest level of water restrictions that can be imposed under law. As such, collection and pH testing of rainwater by interested readers is both welcomed and encouraged. This can be accomplished relatively easily and inexpensively with pH test kits available at aquarium or pet stores.

The results of this testing are as follows:

June 26 : 6.6

June 27 : 6.6

Aug 17 : 6.2

Aug 18 : 6.3

Aug 19 : 6.6

The average of these tests is 6.46, with a sample standard deviation of 0.19. The pH scale ranges from 1 to 14, with 1 being extremely acidic and 14 being extremely alkaline. Distilled water has a pH of 7.0.

The results show that the rainwater samples above are slightly acidic. These results have caused me some surprise, as my expectation was that the rainwater should test on the alkaline side of the scale because of the presence of the hydroxides if the original hypothesis involving barium carbonate is correct.

At this point, the question was approached in a more open manner, and the question was rephrased in the following form: What is the pH of rainwater EXPECTED to be?

The inquiry has resulted in some level of surprise. Two sources have been located in the research on this question thus far, one of them being a professor at the University of Hawaii. A question was posed to the professor in almost exactly the same form that it arose within my work, and this was:

Why is the rainwater at a low pH, such as 5.5 to 6.5, when the rivers and lakewaters are showing a pH at or greater than 7.0, i.e, acidic rainwaters and alkaline groundwaters? The answer was given that it is actually normal for rainwater to have a pH of between 5.6 and 5.8. In other words, an acidic quality to

rainwater at this level is expected. This was stated to occur because of the combination of rainwater with carbon dioxide in the atmosphere, forming carbonic acid through a perfectly normal and natural process. Both sources found stated the pH of rainwater is expected to be at this level, i.e, 5.6-5.8. Acid rain was stated to be in the class when the pH is less than 5.0. The conclusion from this investigation, albeit a surprise to myself, is that rainwater is naturally somewhat acidic.

Considering the results obtained from local rainwater samples with a pH of 6.5, the new information above now casts a different and more congruent interpretation. The rainwater tested locally does show a result which is relatively more alkaline than the expected values, if the two sources are presumed to be correct. An explanation for the relatively more alkaline nature is best explained with the presence of hydroxides (OH) as supposed in the original hypothesis which led to the test in the first place.

The results at this stage, therefore, continue to be consistent, albeit in a surprising manner with respect to pH testing. This is one reason that it will be helpful for other readers to investigate the local pH testing of rainwaters across the country, and to continue to verify the baseline acidic nature which has been stated by the two sources.

5. Physical sample collected in association with aircraft activity:

Another stage of testing of the barium carbonate – barium oxide – barium hydrate hypothesis offered will involve the collection of physical samples if and when they are available. Reports of a whitish powder have occurred intermittently throughout the last two years in association with the aircraft activity, and have been reported on the message forum. With a single exception, samples of material of this nature have not been received by myself.

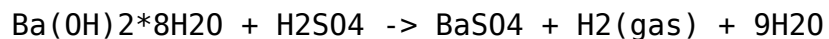
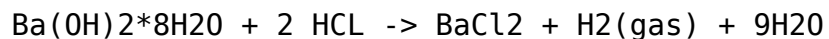
One sample has been received in August of 2000 which satisfies the criteria of being a whitish powder. It was collected in Denver CO on the surface of an automobile after aircraft were observed emitting continuous trails which subsequently developed into the common cloud decks. The amount of material collected was incredibly minute, and exists as a whitish powder or dust. The amount of material available raised the question as to whether or not microscopic examination was even possible.

6. Testing of chemical hypothesis:

A microscopic chemical test of the sample referred to above has been conducted. This test was quite difficult to perform because of the extremely limited amount of material available,

and the results remain in need of substantiation or refutation.

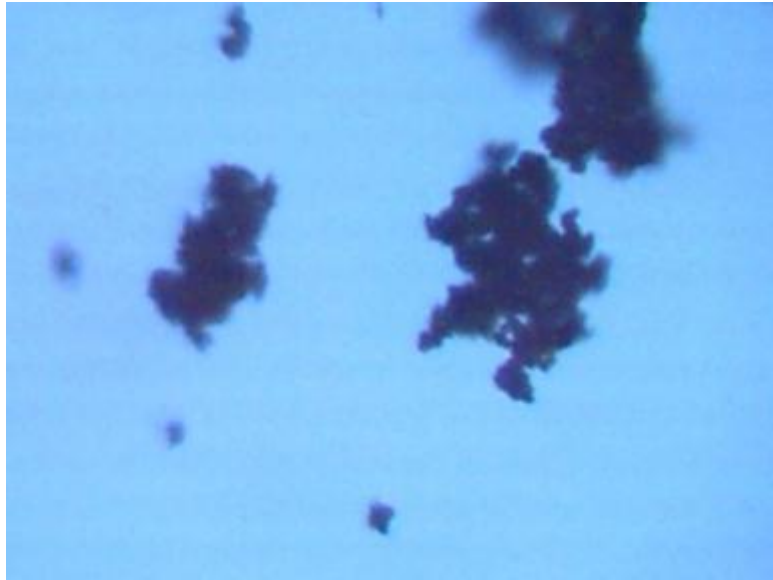
If indeed there is the unusual presence of a barium compound in our atmosphere, particularly barium hydrate, it would be valuable to have a chemical test to help define its existence. The following chemical reactions are offered (again, if errors are found, please notify me):



My research indicates that barium hydrate, if combined with hydrochloric acid, will form barium chloride, which in turn is highly soluble in water. Barium hydrate, if combined with sulfuric acid, will precipitate barium sulfate, a generally insoluble crystal. These results are expressed with the two equations above.

Such a test has been conducted with the powdered sample received. The results would be less ambiguous if more materials were available for testing, but as it was, the amount available for each test resided on the sharp end of a needle.

Three trials were performed. Observations in all cases were out of necessity completed under the microscope due to the extreme scarcity of the material being analyzed. In each trial, the whitish powder immediately dissolved in the hydrochloric acid as hypothesized. In each trial, the whitish powder subjected to sulfuric acid did result in crystal formations. These crystals were photographed under the microscope and will be presented on the web page of this article. The amount of material available for testing was a critical factor, and the need remains to continue this testing as the occasion permits. The results of these tests appear to be consistent with the original hypothesis that is presented, i.e. barium salts or compounds may now have an unusual presence in our environment as a result of aircraft aerosol operations.



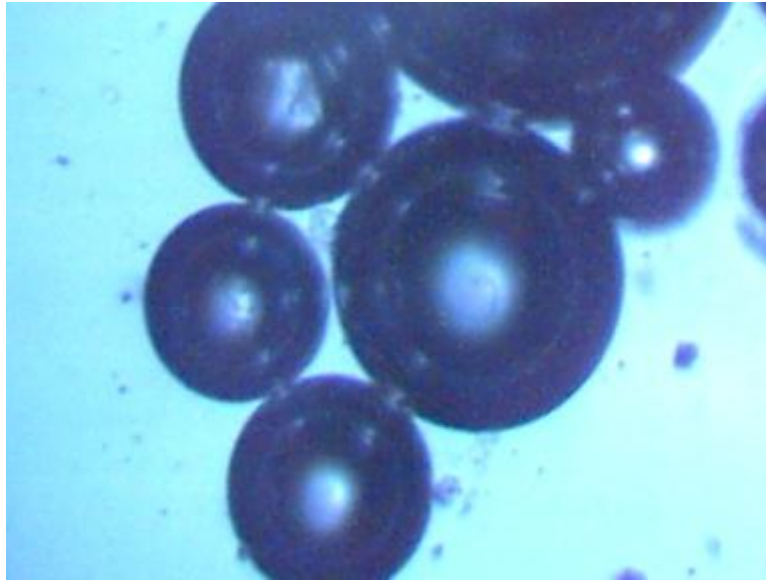
Original White Powder Sample 480x



**White powder subjected to sulfuric acid 480x
Crystal formations apparent**



**White powder subjected to sulfuric acid 480x
Crystal formations apparent**



**White powder subjected to hydrochloric acid 480x
Dissolves immediately, air bubbles remain.**

7. Solubility and equilibrium considerations

There are additional relevant properties of barium compounds, and the earth alkali elements, of which barium is a member. The capacity of barium oxide and barium hydroxide to absorb water appears to be rather striking. Consulting a table of solubility of salts in water, barium oxide is listed most definitely as a soluble salt. Furthermore, when ranked with 60 other salt forms by the solubility constant, barium oxide ranks as number one and as the most soluble within those listed. The solubility constant for barium oxide is stated as .0614; this number outranks the other listings in the table by a factor of hundreds to thousands to multiples of thousands.

In addition, an intriguing reference has been found that describes the ability of certain salt forms to absorb water under varying conditions of relative humidity. Although the specific case of barium hydrate has not been identified as of yet, there does appear to be the case of certain salts absorbing moisture under relative humidity conditions as low as 30%. The specific case referred to identifies a hydrate form of strontium chloride at 0deg C. This salt form under these conditions will absorb moisture under relative humidity conditions of 27%. In addition, strontium is within the same elemental group as barium, the earth alkali series. These findings further substantiate the consideration of barium salts being used in a desiccating aerosol form, supporting the observations of "cloud" formation under conditions of extreme low humidity. Attempts will be made in the future to specifically define the moisture absorption capacities of barium salt forms with respect to relative humidity, but the above example demonstrates the feasibility of atmospheric modifications as have been observed.

[The following information is predictive in nature, and is not intended for the casual reader. It attempts to predict the equilibrium constant of the hydrate reaction involved:

If the salt form in question does indeed absorb moisture at relative humidities of 30% or greater at temperatures of -50deg C. (flight altitude), then the pressure of the water vapor within the hydrate form should equal approximately .0143torr. This is based upon the following:

Pressure of water vapor at -50deg C. is .0477torr (1mb = .750062torr)
Therefore:

$$P(H_2O) / .0477\text{torr} = .30$$

$$P(H_2O) = .0143 \text{ torr}$$

$$P(H_2O) = 1.882E-5 \text{ atmospheres}$$

If the hydrate form is indeed barium hydrate [Ba(OH)₂*8H₂O]:

K_p (equilibrium constant in atmospheres) = (1.882E-5)⁸ = 1.57E-38 atm. at -50deg C.

An important question to now answer is: What is the equilibrium constant, in atmospheres, of the barium hydrate equation that has been hypothesized within this discussion? If reasonable agreement from the actual equilibrium barium hydrate chemical reaction with the above calculation is found, then an adequate explanation for the observations recorded has been found. Any assistance from those knowledgeable in the determination of this constant for the reaction specified is appreciated.]

8. Environmental testing : water, soil, air:

A logical case has been developed within this article to substantiate the need for environmental testing of barium or barium compounds in our water, air and soil. This case does not exclude considerations given to additional tests for different compounds or materials in the future. This case does not eliminate the need to evaluate other forms of physical material associated with aircraft operations, such as the sub-micron fibers or gel samples received and reported. This case does not exclude the need for further identification of certain biological components identified within the fibrous materials mentioned previously.

This case does establish a reasonable requirement and need to test for barium or barium compounds within our environment based upon a logical set of events, reasoning, and tests. Barium is subject to rather stringent environmental restrictions on the amount permitted in the water supply, e.g., 2ppm. This case is dependent upon considerations arising from the science of meteorology, information sources that are consistent with observation reports, physics, pH testing and chemistry.

It is recommended that the readership pursue this testing at a serious and professional level, and that the results be disclosed to the public at the earliest convenience. Any errors or revisions in this report will be made as circumstances require or dictate.

Appreciation is extended to numerous participants on the message forum that have both initiated and contributed significantly to this research topic.

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