Anderson Materials Evaluation, Inc.

Materials Characterization Laboratory

Surface Analysis, Thermal Analysis, Microscopy, FTIR, Electrochemistry

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Quality Policy Manual

Quality and Our Mission

Anderson Materials Evaluation, Inc. offers a broad spectrum of materials analytical services to help its customers shoulder the burdens of materials development and characterization, process and product development, quality control, and failure analysis. We also provide research, consultative, and expert witness services. Each project is managed by one of our three Ph.D. scientists and personally examined for quality by this well-trained, very intelligent, and very experienced scientist.

We collaborate with our clients to help develop goal-directed solutions to their metal, semiconductor, glass, polymer, inorganic and organic chemical, ceramic, composite, mineral, and contaminant material problems. We perform requested analyses, but we more commonly design a custom analytical approach to provide the material understanding needed. To do this we must discuss the background of the problem, define the tasks necessary to address the problem, produce the needed analysis or analyses, and discuss the solution pathway elucidated by the analytical results obtained. After solving or better identifying the problem, we may suggest longer-term R & D for greater benefits. Our primary service is not a measurement. It is materials understanding.

We document our materials investigations with written reports to ensure that clients can fully understand and independently examine the analytical results and conclusions. This establishes a documented history for future process and product development and control issues. Such problems that arise in production often have a tendency to reoccur, so it is important that they be documented and archived. Our reports establish the nature of the material investigated, which may differ from other materials commonly thought to be the same or similar in ways which may be critical for certain applications and use environments. Our reports provide materials characterizations which should be a part of a good quality control system for materials used for production and in final products. A good quality control system matches materials characterizations with product efficacy and materials failures. When no known product or materials problems exist, our materials characterizations can provide a baseline for a problem-free material against which materials characterization changes during failures and other problems can be later compared.

Our efforts to efficaciously address materials characterizations and problem solving activities achieve high quality when we have provided the needed understanding of the materials problem we have been called upon to address at a rational cost and in a timely manner. It has to be remembered at all times that further analysis and effort in understanding a material will generally lead to further understanding. Quality analysis is not equivalent to a perfect understanding of a material, because the client has only limited money and time to provide us for the purpose of characterizing and understanding a material. High quality is achieved when the level of understanding of a material is rationally balanced with the resources made available by the client for a given materials investigation.

Our XPS surface analysis, SEM/EDX, microscopy, thermal analysis, FTIR spectroscopy, and electrochemical measurement capabilities give us many powerful tools to apply to clients materials and process evaluations. We frequently apply these techniques in combinations and in unusual ways to solve materials problems. Quality is not a matter of establishing routines and cookbook recipes. It is achieved in this laboratory by a constant effort to understand our instruments, the method we are using it in, the likely and reasonable properties of materials, a constantly probing mind keenly observing both expected results and anomalous results, and above all the wise interpretation of data to produce materials understanding. Anomalous results must be examined to be sure they are truly due to unusual material properties or because the material is chemically different than we were told it would be, rather than due to instrument malfunction or uncalibrated behavior.

Materials are very complex and there are many of them. They are processed in myriad ways, used in innumerable applications, and in an infinite number of environments, with varied histories. Quality materials understanding is primarily achieved by years of experience spent studying materials with keen observation, a questing, experimental mind, constant, critical evaluations of laboratory results, the development of in-house analytical techniques, discussions with our AME colleagues, client-supplied information, and research information gathered from published sources and the Internet.

Who is Responsible for Quality at Anderson Materials Evaluation, Inc.?

Every employee of the company is responsible. Very little of our work is susceptible to a simple recipe description. All of our work requires the focused attention and rational thought of our employees. Each employee is encouraged to use every resource we have available to become a better scientist. If you need help with any issue that affects the quality of our work, please discuss it with either of the company owners:

Charles R. Anderson, Ph.D., President and Principal Scientist

Lorrie A. Krebs, Ph.D., Vice President and Senior Scientist

or with any of the senior project managers:

Charles R. Anderson, Ph.D., President and Principal Scientist

Lorrie A. Krebs, Ph.D., Vice President and Senior Scientist

Kevin A. Wepasnick, Ph. D., Project Manager

We enjoy talking to our employees about how quality can be improved and about the materials investigations in which you are involved. Every project is a learning experience and learning is fun, though it can be challenging. So, please call on us to help to add as much value as possible to every investigation. We are also seeking to learn from your observations, so please make the effort to keep us in the loop. If a result of laboratory analysis is puzzling to you, it is either something of interest to us or it will provide a great opportunity for us to teach you some materials science or about our analytical techniques.

Dr. Anderson founded the laboratory so he would always be able to provide high quality scientific and engineering evaluations and analyses of materials for a wide range of clients. This company exists because Dr. Anderson finds that he cannot enjoy his work unless that work is reality grounded and we are making very sound scientific judgments. Dr. Lorrie Krebs shares this high regard for scientific integrity and reality.

Dr. Anderson has long specialized in the characterization of surfaces, interfaces, thin films, and coatings. He began applying surface analysis techniques to the solution of materials problems in 1972 with the use of Auger spectroscopy and Mössbauer emission spectroscopy to characterize the magnetic properties of surfaces. Since 1976, he has been involved in team research efforts in which he was helping to interpret the science from the results of measurements made by others using a wide variety of experimental techniques. Since 1980, he has used XPS or ESCA extensively for the analysis of materials properties, often combining XPS and Auger results with those of other techniques such as microscopy, DSC, TMA, FTIR, EXAFS, Rutherford backscattering, electrochemistry, thermogravimetry, SEM/EDX, and XRD to solve complex materials problems. He has had a wealth of experience with surface chemical phase identifications, corrosion, battery development, adhesive failures, contamination, electronic packaging, thin film and bulk materials composition, composite interfaces, particle and sintered ceramic surfaces, surface oxidation and degradation, and many other applications of surface analysis. He has served as an officer of the ASTM Committee E-42 on Surface Analysis and an U.S. Expert on several sub-committees of the ISO Technical Committee 201 on Surface Chemical Analysis. He worked for Case Western Reserve University as a post-doctoral fellow, the Dept. of the Navy as a research physicist, and Martin Marietta and Lockheed Martin as a senior scientist before founding AME, Inc. in 1995. Dr. Anderson especially enjoys integrating the results of multiple analytic techniques to solve tough materials problems. He has assembled a team of materials scientists and engineers with complementary skills and experience who all enjoy working together to solve challenging problems. He is or has been a member of AVS, ASM, MRS, ASTM, the Electrochemical Society, ACS, APS, and SAMPE.

Dr. Krebs specializes in corrosion and degradation issues. She is most experienced in materials testing and selection for corrosion mitigation in engineering applications, in the evaluation of novel coating systems using a variety of testing procedures, and in corrosion-related failure analysis. Among her current interests is the development of new electrochemical testing techniques for AME, which currently include potentiodynamic, potentiostatic, and galvanostatic measurement capabilities. She commonly combines electrochemical analysis with other analytical techniques, such as XPS & SEM, in order to determine a more complete picture of corrosion, degradation, and other failure-related phenomena. She also performs the fracture failure analysis and metallographic investigations of AME. In her dissertation work at the Johns Hopkins University, Dr. Krebs studied passivity and breakdown on iron and iron-alloys using traditional DC electrochemical techniques in combination with spin-polarized neutron reflectivity and x-ray absorption spectroscopy (XAS). As an Army Research Laboratory Fellow, she used electrochemical impedance spectroscopy (EIS) in laboratory and field tests to evaluate non-chromate conversion coatings as potential replacements for the then current chromate conversion coating. In her work at DACCO SCI INC., she was involved in the development of patented in-situ corrosion sensor technology based on EIS techniques. She was also principal investigator for a National Science Foundation Phase I SBIR program investigating Electrochemical Brush Patination, a repair technique for patina on outdoor art objects utilizing a variety of electrochemical techniques and x-ray photoelectron spectroscopy (XPS) to formulate and study artificially grown patinas. Dr. Krebs has served as an Adjunct Professor in the Department of Chemistry and Physical Sciences at Villa Julie College, now Stevenson University. She was the National Association of Corrosion Engineers Program Chairman for the March 2011 national symposium in Houston, Texas and for the March 2012 national symposium in Salt Lake City, Utah.

Project Manager Dr. Wepasnick has experience working with a wide range of materials including biomedical materials, metal and metal oxide particles, self-assembled monolayers, CVD process films, and nanoparticles of various phases and compositions. Dr. Wepasnick joined the staff of AME in 2011 after completing his Ph.D. dissertation work at Johns Hopkins University (JHU) in surface chemistry. There, he focused his research on the surface analysis of functionalized and modified carbonaceous nanomaterials and metal nanoparticles. Primarily tasked with understanding the chemical effects of oxidants on carbon nanotubes, he worked on derivatization methods to label specific functional groups on their surfaces to improve quantitative x-ray photoelectron spectroscopy (XPS) analysis of oxidation effects. Beyond XPS, Dr. Wepasnick applied a wide range of characterization techniques to explore the surface chemical and morphological effects of oxidation, including FTIR, TEM, Raman, Auger, AFM, and STM. He also was responsible for running and maintaining the Johns Hopkins surface analysis laboratory. In this capacity, he interfaced with over twenty independent research groups from industry, other universities, and JHU organizations including the John Hopkins Applied Physics Laboratory and Johns Hopkins Medical. He enjoys using a multitude of analytical techniques to characterize materials and to solve materials problems. Kevin joined AME in 2011 and performs materials investigations utilizing thermal analysis (TGA, DSC, TMA), FTIR, XPS, SEM/EDX, UV/Vis spectroscopy, and optical microscopy analyses.

Receipt and Tracking of Samples from Clients

Sample materials received from clients must be entered as-received on the day they are received in our Sample Log. The material should described in accordance with the customers description of the material at that time. The intended analyses, if this has been decided, should also be entered. The samples remain in our staging area in Laboratory 2 until analysis is to begin, unless the sample is too large to be kept there or some other extenuating circumstance applies. It is important to remember that some samples are unique and cannot be replaced. If a sample must be replaced, this will also delay results.

Sample materials must be handled so that they are not contaminated. In many cases, clean gloves should be worn when handling a sample. Samples should not be allowed to become contaminated by other samples, either inside or outside of instruments. When removing powders or liquids from the containers in which we received them, any utensils that come in contact with the materials must be kept clean. If the material must be cut, care must be taken that any saws or cut-off wheels used and removed material, does not contaminate the material to be analyzed. The areas to be analyzed must be protected, which may require them to be wrapped. After cutting, blowing the sample off with filtered, dry nitrogen gas may be necessary. The laboratories must be kept clean so that samples will not be contaminated. It must be remembered that the order of analysis by some techniques may matter due to changes induced in the sample by those techniques. Oftentimes, this can be addressed by separating out material sufficient for each analysis and keeping those samples thereafter separate.

Each of the major analytical instruments has a log book to track the samples analyzed and to record when they were analyzed. This is important both for tracking samples and so that any post-analysis into a possible contamination issue can be addressed. There are also cases in which a sample causes damage to an instrument, so this tracking helps us to maintain the quality of the instrument. In other cases, it may help us to address when an instrument may have gone out of calibration.

Calibration and Maintenance of Instruments and Analytical Techniques

Understanding and characterizing materials critically relies on appropriate and careful scientific measurements performed on a given material. The huge number of materials, their property dependence upon ingredient sources and process histories, their many applications, and their many environmental exposure histories produce a wealth of complexity and surprises. Therefore, it is not adequate for us to simply act as consultants, offering advice based on limited prior experience. No one has lived long enough and seen enough to rationally dispense with an actual examination of material properties in many cases. The microscopic, spectroscopic, and simple observations of materials handling characteristics that we observe in the laboratory play a critical role in characterizing materials and allowing us to address our clients materials problems.

Barring knowledge to the contrary, we will follow the manufacturer's advice on instrument calibrations and maintenance. However, that advice is often given for a newly developed instrument with which the manufacturer has but limited experience, so it is proper for us to gather our own knowledge on how to calibrate an instrument and how often to do so. Sometimes the manufacturer is significantly wrongheaded to the degree that what it directs one to do for calibration is broadly wrong. Other times the manufacturer simply overlooks other factors that also need calibration.

The manufacturer may also have to assume that the environment in which the instrument may be used is of a lower quality than that of well-run laboratory. They may also assume that the people using the instrument are not very careful in handling it. Some materials analyzed with an instrument may cause instrumental degradation, such as corrosion of the DSC cell. Many runs to higher temperatures over a period of time in the thermal analysis instruments will increase the rate of instrument materials degradation and require some combination of more frequent calibration or replacement of parts. Extensive sputtering in the XPS system may cause insulating films to build up on conductors in the forward lens elements of the input lens for the energy analyzer. The analysis of many materials with higher vapor pressures or of larger surface areas of such materials in the XPS system or even the SEM will increase the frequency of required maintenance. So, calibrations and maintenance should be a rational function of the use of an instrument and not simply tied to a calender schedule as most simple-minded calibration standards are.

It is also important to evaluate the calibration of an instrument in terms of the measurement's purpose. For instance, an instrument may need to have its calibration and its variability of response checked if one is about to make a measurement of a property of two materials in which the difference between the two values of the property is likely to be small, but has to be known with critical accuracy. The customers' requirements for measurement accuracy may also vary for many reasons and we need to consider that fact, when we are aware of it. When we are training a newly hired scientist on the use of an instrument, we should also check its calibration more frequently than we will have to do when that person is more experienced.

It is critical to maintain a constant vigilance for the proper or improper operation of an instrument. One should always be asking oneself if the measured property has a reasonable value given our past experience or given reference source values. We do not assume that the reference source is right and our measured value is wrong, but we do need to develop an understanding of whether the measured value is the result of a good measurement and whether other analyses in the laboratory support a difference in the chemistry or structure of the material which will account for the difference in the measured property. When we have an understanding of the properties measured and they are consistent between techniques, each such case is a reassurance to a degree that the instruments are functioning well. We often do examine a material we are well-familiar with and hence its measured property should be known to us. Be aware of the history of such reassuring measurements and that time when anomalies begin to appear.

Each major laboratory instrument has a calibration and maintenance log kept near it. That log should be kept up-to-date with calibration and maintenance procedures and dates. Observations of an instrument's behavior can be documented as well. If an unusual problem which we have repaired occurs, it is well worthwhile to describe it and the solution for fixing it. For instance, if a certain capacitor, IC, power transitor, or resistor died and had to be replaced in a controller, that should be recorded. Given instruments often have repeating failure modes and it will help us to get back up and running when that failure occurs a second time if it has been well-described the first time it occurs. Memory does not always serve well when a failure mode only occurs once every five years.

It may happen that a measurement has been made which is not good, but was not then recognized as questionable. If later knowledge calls the measurement into question, we will make the measurement again correctly and report the change to the client. If the problem owed to the calibration of the instrument or a problem with the instrument or how we operated it, we will not charge the client for the corrective work. Sometimes, misinformation from the client causes an inadequate measurement to be made and we may then need to talk to the client about having him bear the costs of the additional resulting measurement. There is no mistake as bad as a failure to admit to a mistake. There is no failure as bad as that to purposely remain wrong. Reality and its physical laws rule and every scientist must recognize that or he has broken a sacred trust.

Sample Selection, Handling, and Identification

Sample selection is often a factor critical to our success in solving a materials problem. This is most often largely in the hands of the customer, but we must play our role well. We can often advise the customer on some issues relating to sample selection, but we are still dependent upon the customer's observations at their site and upon their knowledge of such issues as processing history. When we receive a sample, we should document its appearance as received. We should also usually examine the material with an optical microscope for often readily accessible information on sample homogeneity or a lack thereof. Commonly we take a portion of a sample sent to us and analyze it with one or more of our instruments. Choosing that portion of the material to be representative of the problem to be addressed requires care and judgment. Oftentimes, we will need to characterize multiple areas of a sample and correlate the results with the varied appearance microscopically or macroscopically. It is important to document where sub-samples for analysis were taken from the as-received sample.

Sample handling by the customer is also important. For instance, samples sent for surface analysis by XPS should not have been handled with bare hands, exposed to oily or otherwise contaminated air, or packed for shipment in materials which will either rub onto the sample, expose it to bad outgassing, or abrade the surface of the sample to be analyzed. Each technique of analysis will have issues relating to sample contamination and customers may need advice on what these issues are and how to avoid the problem. For many of our analyses, we also must handle the samples with clean gloves. This will always be true for XPS analysis, for instance, because even though the actual area to be analyzed can be kept free of contact, other areas touched will outgas badly in our XPS vacuum system. In addition, it is not unheard of to find that an area whose analysis was not thought necessary to analyze becomes so as we learn more about the sample. Fingerprints are also a big problem for microscopy and electrochemistry analysis. Sampling liquids that settle or powder samples with inhomogeneous size distributions also requires care to acquire a representative sample.

In some ways, a related problem may be how to advantageously mount a sample for XPS, SEM, or optical microscopy. The size or largest dimension of a sample for one of the thermal analysis techniques must be consistent with the thermal conductivity of the sample with concern for how much the interior temperature of the sample lags that of the exterior for a given heating rate. The property of the material to be investigated, the chemistry of the sample, its shape, its size, its uniformity or lack thereof, are all factors which will affect preparation for analysis and sample mounting. Serious thought needs to be given to these issues.

We often receive samples from customers labeled A, B, C, D or 1, 2, 3, 4. This may be all they will want to provide for proprietary reasons or simply because they love blind testing. When possible, it is better if we can get a customer to provide us with extensive information. The more we are told about the material, the processing, the use, and the environment of the use, the more likely we are to be able to develop the appropriate and efficacious plan to combine the most useful and insightful analytical tools. In addition, technical engineers and chemists come and go from companies. When a related problem arises two years later, we often have served as the corporate memory, but our ability to do that may be reduced by virtue of the fact that no one at the client company has any memory of what sample A and B were anymore. It is also good to obtain information on lot numbers, part numbers, serial numbers, date of production, date of sampling, and other similar information when possible. That information should then appear in our report on the analysis.

Characterizing the Material with Appropriate Property Measurements

Making an analysis plan to properly characterize the client's material(s) to understand the issues to be addressed is not at all trivial in many cases. Indeed, it can be very difficult and one may find in the process of investigating the materials problem that a change of course is needed in view of the results obtained to-date. This should be done with all due professionalism. To do this correctly, one must be focused on the materials properties determined from the interpretation of the measurement data, laboratory observations, and such information as we have from the customer or his suppliers. In some cases, we start with little information, while in others we may have a very large amount of irrelevant information and some wrong information as the project starts. It is important to keep focused on the understanding and interpretation of all of this information so that we can devise and revise the measurement plan as needed. Of course, we sometimes have to balance this problem-solving approach with the customer's purchase order requirement which may specify that we perform just those measurements quoted and that we delete none, even when we learn some are not useful for solving the materials issue. Good long term relationships with customers make the rational deviations from the initial plan much easier to carry out. We aim to develop such relationships of trust, but we also need to be aware of those cases in which a customer is too new to have that level of trust in us. In such cases, any significant deviation from the plan should be discussed with the customer and we should explain why the change of plan is needed.

Sometimes, we need to coordinate our results with those of another laboratory that can make a measurement we cannot make. In such cases, we often need to include their result in our discussion to derive the best understanding possible from the several materials properties that may have been measured. Other laboratories are often more eager to provide a property measurement than they are eager to explain how that measurement may add to the understanding of the particular materials problem under investigation. It often falls to us to explain that along with our own results and how they provide information on the problem or issue. If the other laboratory does address the implications of their measurement for the issue under investigation, we will generally wish to state their belief along with our own. We will evaluate all of the results and try our best to provide the most rational explanation of the materials properties and their consequences. This may lead us to disagree with the other laboratory on an issue. If so, we will do so respectfully in the report and supply our carefully reasoned argument for our interpretation. There are rare cases in which a laboratory with a small part in the investigation may not have the necessary information to contribute meaningfully to the interpretation. Sometimes, specialty laboratories also only think in terms of their specialty. So, there may be good reason just to leave out their unlikely interpretation in some cases. But, you must have a rational argument to supply before you do so.

Many materials investigations are complex enough that multiple analytical techniques are required to come to the necessary understanding of the materials issue. The information that results can be very extensive and the correct interpretation of the data in a self-consistent way may be very complex. We cannot guarantee that the best explanation of the materials properties and capabilities that we can construct from such investigations will always be entirely correct. Commonly, our clients will not provide us enough money and time to provide that guarantee. We have had a good record of helping clients solve their problems and we must always strive hard to provide the best solutions and understanding we rationally can. The use of multiple techniques allows us to find many complementary properties and some redundancy between different techniques. A more complete picture is formed, but the challenge to come up with a well-integrated and self-consistent understanding may become greater, even as the probability of being able to correctly identify the best explanation of a problem increases. When a problem becomes complex, be sure to consult with other scientists on the staff and to check with our library of materials technical books and periodicals for helpful information. It may also be helpful to use the resources of the materials science and chemistry library collections of The Johns Hopkins University library or the University of Maryland at College Park library.

Reporting the Results of a Materials Investigation to the Client

Our reports should clearly explain the background of the materials issue we are addressing for the client. A report should document what materials were analyzed and any materials preparation performed to do the analysis. It should explain how they were analyzed. The results of the analysis should be provided and the meaning of those results in terms of the materials properties should be explained. We then need to inform the client how all this bears on the materials issues he is having.

Our client companies and the particular persons we are communicating with on a particular project have a very wide range of scientific and engineering knowledge. Few of them are laboratory scientists, so they cannot be expected to know a great deal about the science we are applying to investigate their materials issues. It is our responsibility to try to educate them with enough knowledge so that our results are useful to them in solving their internal issues with the materials we have investigated for them. Be respectful when you are talking to them or writing the report. Remember that they are experts in things we are not expert about. As we work with a client, we need to try to assess how scientific and technical their knowledge is and adjust our communications with them to help them to understand our results and how they bear on their problems. Educating a new client is an opportunity to make it possible for them to understand how we can help them with many more of their present or future problems. It can help to convince them that spending more money on us in investigating their materials issues will pay off for their company. It is very common for us to see more and bigger projects in the future from customers we have made the effort to educate. Of course some will not make an effort to learn much, but many do just as one expects a professional to do when he sees that an effort will make his company more profitable. Go the extra mile with those clients who are interested in learning more. They deserve it and it often helps us in the long run.

Sometimes a client will ask us to alter an issued report. There are both valid and invalid reasons for this. Let us break this down into the valid and the invalid reasons. We are willing to make alterations for these valid reasons, but not for these invalid reasons.

Valid:

- The client may have a supplier or a customer he wants to share the report with, minus some proprietary information.
- The client may want us to consider more information he has on the materials or the processing of the materials so that a deeper understanding of the issues may be attained.
- The client may have a rational argument that some part of our interpretation or understanding is wrong.
- The client may send us more materials for analysis and wish to have those results added to the report with any resulting interpretation and understanding changes.

Invalid:

- The client may want the report to be biased against his vendor's materials or services.
- An employee of our client who is embarrassed by an error he made might request that we hide the error. We must not cover up the error, though we do not want to rub it in. Reality rules, but we will not call the employee a dunderhead in the report. People make mistakes and the important thing is simply that they correct them and try to prevent them in the future.
- A client or his attorneys involved in a court case or possible court case may try to get us to provide expert witness testimony which is at odds with reality and the laws of physics. We do not provide such testimony. We are abhorred by wrongful legal findings which punish the innocent. We will only provide the best scientific testimony we can. If that helps the client paying us, fine. If it does not, then that client is best served by understanding his responsibilities and meeting them. It is best that he provide such quality that he will not be sued in the future or will be found innocent in the future on the basis of good science. We have seen other

> laboratories provide nonsensical scientific testimony to suit their client's interest in a legal case. It is disgusting, unethical, and damaging to innocent people.

Reality and a rational assessment of it must rule for any scientist or he has betrayed his profession and the many years of hard study and thinking that made him a scientist. Denying reality is really the ultimate evil, since all evil proceeds from this. Just as our clients have a right to expect scientific integrity from us, we have a right to demand that they are of a high enough quality that they will respond favorably when we provide accurate knowledge of reality to them.

Clients sometimes lose the copies of the reports we send to them. Sometimes, the person we sent it to leaves the company and we become their corporate memory on the investigation. We have had a client employee call us and describe a problem we previously solved for his company and found that he had no knowledge of the earlier work. We will then describe those results and see if that does not again solve their problem. Some problems have a tendency to reappear in a particular material's processing history. We must therefore be careful to keep client reports adequately backed up on multiple digital storage media. We also keep a hard copy in our file cabinets. We will keep such reports for at least five years. Presently, we actually have them going back 12 years. These reports are all considered proprietary information by AME and must be handled in an appropriate way to protect our clients and their information. Should a client request that we not retain our reports or other information, then we will not retain that information.

Quality and Employment at Anderson Materials Evaluation, Inc.

When employees perform high quality work at AME, Dr. Anderson and Dr. Krebs have valued their services so highly that we have gone months without paying ourselves to retain such employees during hard times such as the Great Recession. If an employee's laboratory services and scientific judgment are found to be lacking, that is fully adequate reason that we must fire such an employee. We understand that there is a learning curve for new employees, but we must very quickly be reassured that each new employee is highly committed to performing his laboratory work carefully and with rational thoughtfulness. We are happy to train willing and eager learners, but it is an expensive effort on our part. Those employees who are not willing to make the effort to become professional laboratory scientists and who do not accept the idea that reality rules, will not be long tolerated. Clients bring projects to us so that they will make a profit and be able to keep their employees in their jobs. If you do not do your job well, you are doing harm to the owners and the employees of our client companies. You will take the quality of your work very seriously, or you will be having some very unhappy conversations with Dr. Charles Anderson and Dr. Lorrie Krebs.