January XX, XXXX

VIA FEDERAL EXPRESS
United States Citizenship and Immigration Service
Texas Service Center
4141 N. St. Augustine Rd.
Dallas, TX 75227

Re: EB-1 Petition for Outstanding Researcher or Professor by XXX University on Behalf of Dr. XXXX

Dear Sir or Madam:

I represent XXX University, and Dr. XXX, and my G-28 is attached. Dr. XXX is currently in the U.S. in H-1B status. She is presently a Professor in the Department of Mathematical Sciences at the prestigious XXX University. XXX University submits this EB-1 petition on behalf of Dr. XXX, a world-renowned leader in applied mathematics and an internationally recognized expert in scientific computing and development of efficient models and numerical algorithms, as an outstanding researcher and professor pursuant to 8 CFR § 204.5(i). This petition will present overwhelming evidence that Dr. XXX qualifies for the classification sought. We are attaching letters from world-renowned scientists attesting to the international reputation of Dr. XXX's work.

With regards to her work with the XXX (XXX) on newly formulated techniques **that will be used by XXX** for modeling of grain growth and recrystallization, Dr. XXX states:

> **Dr. XXX's findings** viewed in the context of aluminum and steel applications **will inevitably have an enormous effect on the future of the automobile industry and ground transportation in general**. See Exhibit 04 (emphasis added).

XXX, PhD, Professor of Mathematics and Professor of Materials Science at XXX University, founding scientific director of XXX best explains the significance of Dr. XXX's research in light of our nation's current economic crisis:

> Never has the world been so acutely aware of the inextricably linked issues of energy, environment, economy, and security. We feel it in the rising gas prices, global warming manifestations, growth in unemployment rates, escalating political and economic instabilities…**Dr. XXX has made critical discoveries in the area of materials modeling that will be indispensable in advancing the synthesis of novel materials required for modern energy, transportation, security, and medical applications**. **Her work has revolutionized the way engineers look at materials** and equipped them with powerful tools for predicting materials response to the changes in external conditions. **This line of work…will clearly be instrumental to finding solutions to the global economic issues our country is facing**. See Exhibit 03 (emphasis added).

XXX, PhD, Chair & Francis Eppes Eminent Professor, Department of XXX at XXX University acclaims:

> Her [Dr. XXX] most recent work focused on microstructure evolution for which she has **developed very innovative statistical theories** that have hugely contributed to the understanding of interface dominated materials properties and of their control and optimization. Her findings have **opened a new direction in materials design and manufacturing** which will make it possible in the near future to deploy a new generation of materials **capable of delivering huge energy savings and dramatically increasing their cost efficiency**. In addition, **this work has important application to biological, medical, and chemical systems which underlie a variety of sectors of the US economy**. See Exhibit 06 (emphasis added).

XXX, PhD, endowed XXX Professor of Mathematics and Professor of Materials Science at XXX University confirms the importance of Dr. XXX's research:

> She [Dr. XXX] has already obtained ground-breaking results concerning the grain growth statistics and has established a new framework of looking at the interface evolution through the coupling of Levy processes and traditional random walk theory…Dr. XXX's **research in the field has a significant impact on the national economy, technology and security**, **as her research has direct applications to high-performance materials in these areas**. Her research in this area is extremely challenging because it requires advanced analytical tools and scientific computational techniques which only a **handful of elite scientists in the field** possess. See Exhibit 02 (emphasis added).

These are but a sample of the attached support letters attesting to Dr. XXX's world-renowned stature as one of the world's leading applied mathematicians. As we shall demonstrate, **Dr. XXX meets all of the criteria specified under 8 C.F.R. § 204.5(i) as an "Outstanding Professor and Researcher."**

Following is a brief summary of Dr. XXX's extraordinary qualifications, ability and evidence of the acclaim she has already received. Her achievements are stated in greater detail in this letter and in the attached support letters from world-renowned scientists.

OUTSTANDING PROFESSOR AND RESEARCHER CRITERIA FROM 8 CFR § 204.5 (i)

To qualify as an Outstanding Professor or Researcher, the alien must be able to provide evidence of the following.

1. **Evidence that the professor or researcher is recognized internationally as outstanding in the academic field specified in the petition.** Such evidence should consist of at least two out of six criteria. **Dr. XXX meets all of these criteria**:

A. Evidence of the alien's original scientific or scholarly research contributions to the academic field

Dr. XXX's conducts research aimed at developing novel efficient numerical algorithms and providing more accurate descriptions of real-life phenomena in the form of mathematical models and simulations. In particular, she has been actively involved with several interdisciplinary research groups from the Department of Computational Data Sciences, Physics and Biology. Being part of these research collaborations, she continues her work aimed at bridging the gap between scientific an engineering communities and bringing mathematical breakthroughs to serve the industrial, medical and economic needs of our country.

B. Evidence of the alien's authorship of scholarly books or articles in scholarly journals with international circulation

Over the course of her career, Dr. XXX has contributed numerous papers to peer-reviewed journals of international repute in her field. Among the prestigious journals that have featured her work are *International Journal of Numerical Analysis and Modeling, SIAM Journal of Numerical Analysis, and SIAM Journal for Scientific Computing*, all of which are in circulation around the world. See Exhibit 14.

C. Published material in professional publications written by others about the alien's work in the filed

Dr. XXX is renowned globally for her outstanding work. As an author of numerous articles in national and international peer-reviewed publications, her work highly cited, indicating both that her research is highly relevant and that her findings has a positive impact on the works of others. That Dr. XXX's work has been showcased in the international journals and media are a testament to the cutting-edge nature of her work, and her global elite stature in her field. See Exhibit 16.

D. Evidence of an alien's participation, on a panel or individually, as the judge of the work of others in the same or allied academic field

Dr. XXX has the distinction of being asked to review articles submitted for leading conferences, including, SIGGRAPH (International conference and exhibition on computer graphics and interactive techniques) and publications to leading international scientific journals, including, *CALPHAD*, *International Journal for Numerical Methods in Fluids*, *Pattern Recognition and Modeling and Simulation in Materials Science and Engineering*.

In addition to reviewing articles for a number of world-renowned scientific journals, Dr. XXX also serves as a panel judge for Master and PhD students preparing their dissertations and mentor for undergraduate students. See Exhibit 13.

E. Documentation of the alien's receipt of major international prizes or awards for outstanding achievement in the academic field

Dr. XXX has been the recipient of highly competitive international fellowships as well as several national awards and grants. See Exhibit 11.

F. Documentation of the alien's membership in associations in the academic field which require outstanding achievements of their members.

Dr. XXX was awarded membership in a nation-wide selective network of Project NExT fellows. She is also a member of the Society of Industrial and Applied Mathematics, the American Mathematical Society, the American Mathematical Society, and the Computational Materials Science Network. See Exhibit 12.

2. **Evidence that the alien has at least three years of experience in teaching and/or research in the academic field.**

   Dr. XXX has been conducting research and teaching at XXX University and XXX. See Exhibit 19.

3. **An offer of employment from a prospective United States employer.**

   Dr. XXX holds the position of Assistant Professor within the College of Science at XXX University. See Exhibit 17.

OVERVIEW OF DR. XXX'S RESEARCH

Dr. XXX is a Professor in the Department of Mathematical Sciences at the prestigious XXX University (XXX). XXX is an innovative and rapidly growing public university located just outside of Washington, DC. XXX boasts many top-ranked graduate and undergraduate programs and have just been ranked as a #1 in the list of "Up and Coming" national universities in U.S. News and World Report's annual rankings of the top institutions in the country this year. XXX's outstanding faculty includes Nobel laureates, Pulitzer Prize winners, elected officials, as well as experts from D.C. area think tanks and research facilities. The Department of Mathematical Sciences provides a focus for cutting-edge research related to applied mathematics, as well as numerical analysis, modeling and optimization and its applications in the fields of material and biological science. The Department is an interdisciplinary research center and has strong ties with several government agencies including the National Science Foundation, the Department of Energy, and the Department of Defense.

Dr. XXX's research is in the area of applied mathematics, specifically, scientific computing and development of efficient models and numerical algorithms. Her research is focused on the development, analysis, implementations, and use of methods (i.e. algorithms) that she and others can use to solve important classes of scientific and engineering problems on computers. Her work reflects an interplay between mathematical theory and complex real-life phenomena.

Background on Research Area

Never has the world been so acutely aware of the inextricably linked issues of energy, environment, economy, and security. We feel it in the rising gas prices, global warming manifestations, growth in unemployment rates, and escalating political and economic instabilities. Take the energy crisis for example. As the economies of developing countries boom, so does their demand for energy. Today nearly a quarter of the world does not have electrical power yet the demand for electricity is projected to more than double over the next two decades. Increased demand for energy to power factories, transport commodities and people, and heat/cool homes also results in increased CO2 emissions. As global CO2 emissions grow, the urgency grows to produce energy from

carbon-based sources more efficiently in the short term and to move to non-carbon based energy sources, such as solar, hydrogen, or nuclear in the long term.

Materials are central to every energy technology, and future energy technologies will place increasing demands on materials performance with respect to extremes in stress, strain, temperature, pressure, chemical reactivity, photon or radiation flux, and electric or magnetic fields. For example, today's state-of-the-art coal-fired power plants operate at about 35% efficiency. Increasing this efficiency to 60% using supercritical steam requires raising operating temperatures to nearly 50% and essentially doubling the operating pressures. These operating conditions require new materials than can reliably withstand these extreme thermal and pressure environments. To lower fuel consumption in transportation, future vehicles will demand lighter weight components with high strength. Next generation nuclear fission reactors require materials capable of withstanding higher temperatures and higher radiation flux in highly corrosive environments for long periods of time without failure. These increasingly extreme operating environments accelerate the aging process in materials, leading to reduced performance and eventually to failure. If one extreme is harmful, two or more can be devastating. High temperature, for example, not only weakens chemical bonds, it also speeds up the chemical reactions of corrosion. However, we do not yet know all the equations that govern materials response to these extreme environments, and hence the path from discovery to production of functional materials takes many years and even decades. Accurate and validated computational modeling is the way to break this impasse and its development is giving rise to important new science.

The focus of Dr. XXX's recent work has been on the development of novel statistical theories for microstructure evolution. By investigating the intimate relationship between grain growth dynamics and fractional continuous time random walk theory, she was involved in various aspects of stochastic modeling and uncovered the wealth of fascinating research topics associated with this field. She is actively involved with the XXX NSF Materials Science Research and Engineering Center (XXX) dedicated to the understanding, control and optimization of interface dominated materials properties. This work triggered further research opportunities in biological, chemical and medical applications and initiated several critical collaborations in those areas.

Additional areas of her current research include the design of fast new algorithms for computational geometry and computational materials science, with the use of the concepts like clustering, centroidal Voronoi tessellations and optimization methods for the determination of phase diagrams for multicomponent materials. In studying these topics, the ideas from the theories of multigrid methods and adaptive computations have been extended to solve wider classes of nonlinear problems. She has been an active member of the XXX project at XXX which is funded by a major XXX grant to develop computational tools for multicomponent materials design in support of national priorities.

Within the field of applied mathematics, Dr. XXX has recently focused on several cutting-edge projects, which have resulted in numerous publications, speaking invitations, and media attention around the world. Dr. XXX has extensively collaborated

with scientists from around the world and made use of these international collaborations in making novel discoveries in the field of applied mathematics. Dr. XXX has made excellent scientific contributions apart from her teaching commitments. Her major contributions are the outcome of the following emerging techniques and scientific approaches:

I. Mathematics of Materials: Grain Boundaries and Phase Diagrams

The development of new materials and the capability of tailoring existing materials to meet new and demanding applications is critical for continued improvements in the quality of human life. Traditionally, the field of materials science and engineering predominantly focus on the processing of materials, establishing structure-property relations, and measuring materials properties. This empirical approach is increasingly shifting towards the design of materials to achieve optimal functionality, driven largely by advances in information technology and computational materials science. Dr. XXX leads the effort by providing groundbreaking contributions to several key materials research areas.

Take phase diagram calculation for instance. Phase diagrams are visual representations of the equilibrium phases in a material and are frequently used as basic blueprints for materials research and development. Dr. XXX designed a novel state-of-the-art reduced complexity algorithm for phase diagram calculation based on adaptive critical point detection approach. It allows to study many technologically useful materials with a much higher degree of accuracy than before and explain what happens when they undergo various physical and chemical transformations. In particular, her scheme allows to create correct phase diagrams, or footprints, for materials that have been consistently misrepresented in materials science reference books and databases.

Another example is Dr. XXX's work related to grain boundaries in polycrystals. Most metallic and ceramic materials used in aircraft, automobiles, energy applications and devices such as computers are polycrystalline. In other words, they are made up of many microscopic crystals joined at the grain boundaries. Dr. XXX's research in this area is focused on the planar defects known as grain boundaries that form extensive networks between the individual grains of polycrystalline materials. It is widely recognized that the types of grain boundaries in a material and the manner in which they are connected affect a wide range of properties from strength to corrosion resistance and thus the performance and lifetime of engineered devices.
In Dr. XXX's polycrystalline systems research, her goals were to quantify the characteristics of polycrystals that arise during processing, to develop strategies for influencing these characteristics in predictable ways, and to define micro-structural metrics that can be directly related to macroscopic properties and performance. Grain boundaries have a property called "grain boundary energy", which is responsible for how strong the grains are connected to each other. Depending on the energy, polycrystalline structures may have very different properties. Very little is known about this energy and its dependence on the crystallographic nature of the boundary. Dr. XXX succeeded in making remarkable progress in quantifying the kinetics of grain growth

that has contributed directly to material science community's understanding of the influence of grain boundaries on microstructural evolution.

This touches upon many fundamental uses of materials that we as a society rely upon. Below are some examples of such use.

A. Alternative Energy Sources

Sunlight does not use up an irreplaceable resource and its conversion to electricity is nonpolluting. Photovoltaic systems are an attractive alternative to fossil or nuclear fuels for the generation of electricity. In fact, photovoltaic systems are now in use where power lines from utility grids are either not possible or do not exist, as in outer space or remote, nonurban locations. The application of materials science is essential in efforts to lower the cost to levels that can compete with those for fossil and nuclear fuels. The barrier to widespread use of sunlight to generate electricity is the cost of photovoltaic systems. For each material there is an intrinsic rate of recombination of electrons and holes that limits their contribution to electric current. This recombination is enhanced by surfaces, interfaces, crystal defects such as grain boundaries, dislocations, and impurities. The materials challenge is to find a combination of cost and efficiency that makes photovoltaic electricity economically possible. In most cases, however, our ability to predict and control the materials properties that are governed by the grain boundaries is severely limited by our incomplete knowledge of the network structure and the behavior of individual interfaces.

Dr. XXX has succeeded in isolating and contributing to an understanding of the various mechanisms by which a mathematical distribution develops from an initial population. By means of her concentrating efforts on the mechanisms of governing this process she has overcome one of the major difficulties in developing a theory of the grain boundary character distribution, namely, the lack of understanding of stochastic events. The theoretical framework she has developed is capable of describing the fractional nature of the grain kinetics and is expected to lead to a proposed unified model with generalized fractional master equations – a discovery that has profound implications for the way materials will be treated in experiments and simulations in the nearest future. Dr. XXX has discovered that there is a time variable scaling, which puts mathematical models for grain growth within the scope of homogeneous jump processes that makes grain growth amenable to the wide range of stochastic analysis tools. Armed with this knowledge, materials engineers will be more capable of manufacturing materials with required properties, be it photovoltaic systems for solar energy sources, ultra strong steel alloys for fuel-efficient vehicles or super-durable materials used to increase the distance traveled by aerospace structures. To ensure rapid implementation, Dr. XXX works collaboratively with government, industry, and international laboratories, which are greatly benefiting from the availability of such predictive analysis.

B. Medical Applications

The treatment of many human disease conditions requires surgical intervention in order to assist, augment, sustain, or replace a diseased organ, and such procedures involve the use of materials foreign to the body – these materials are known as biomaterials and include polymers, metal and ceramics. Other materials, known as smart bio-inorganic nano-based materials, can be used to transport nutrients inside the body or deliver targeted treatment to organs – a practice commonly used to treat several cancers. With a tremendous increase in medical applications, demand for a wide range of biomaterials grows by 5 to 15 percent each year. In the United States alone the annual market for surgical implants exceeds $10 billion. Nevertheless, applications of biomaterials are limited by biocompatibility, the problem of adverse interactions arising at the junction between the biomaterial and the host tissue. Optimizing the interactions that occur at the surface of implanted biomaterials represents the most significant key to further advances, and an excellent basis for these advances can be found in the growing understanding of complex biological materials based on technological innovations made possible by Dr. XXX work.

Dr. XXX's research in this area is focused on the phenomena occurring at the interface between organic and inorganic parts in bio-material. The network of interfaces separating components in such a material can be compared to soap film separating two bubbles of air in soap froth, though it can be extremely more complex. Many interesting questions remain about the evolution of materials interfaces, which puzzled materials scientist and mathematicians for decades. Dr. XXX has developed the foundations of rigorous mathematical theory explaining these phenomena that gives a completely new perspective on the subject and will be of practical importance to engineers and scientists alike. She has shown that there is a universal law that governs the behavior of the material on a microscopic level and has put exact numbers in predicting possible radical changes in materials behavior under changing external conditions, such as stress, temperature or other interactions.

C. Petroleum Applications.

In addition to bio-inspired applications, these findings will directly benefit many other areas of technology and economy. For instance, it will aid in preventing crack growth in offshore oil-drilling platforms – structures that consist of welded steel tubing that is subject to continually varying stress from ocean waves. Since the cost of building and deploying a platform can amount to several billion dollars. It is imperative that the platform have a long life and not be lost because of premature metal failure. Fatigue occurs because cyclic stress causes dislocations to form and to move back and forth in the metal. Dr. XXX's research makes an enormous contribution to this problem by supplying revolutionary mathematical modeling techniques, which along with studies of solidification, gas dissolution, and the effects of fluxes, can provide a much more detailed understanding of the factors controlling the evolutions of dislocations in weld structures under stress. With this knowledge, it should be possible to make welds with far fewer defects which will have a major impact on the oil-drilling industry and the US economy.

Thus it is evident that Dr. XXX has made extensive strides in developing innovative statistical theories that have contributed to the understanding of interface dominated materials properties and of their control and optimization.

II. Computational Geometry.

Dr. XXX has made significant contributions to the field of computational geometry. Her work has led to novel methodologies now in common use in statistical clustering, image compression and segmentation and many other fields. The extremely fast computational algorithms for constructing XXX (also called XXX) designed by Dr. XXX are now being incorporated into commercial codes in many leading research laboratories and R&D companies around the globe, including such renowned institutions as XXX for Research in Computer Science and Control and XXX Laboratory in the UK. Applications of this nature span a variety of scientific disciplines and technologies, such as XXXX in astrophysics and high energy physics, patterns in plant biology, data mining, computation geometry and image reconstruction, sensor networks in military applications as well as many others. For instance, one area of application of CVTs is called Remote Sensing. Remote Sensing is a technology for sampling electromagnetic radiation to acquire and interpret non-contiguous *geospatial data* from which to extract information about features, objects, and classes on the Earth's land surface, oceans, and atmosphere (and, where applicable, on the exteriors of other bodies in the solar system, or, in the broadest framework, celestial bodies such as stars and galaxies). Such technology is widely used in military intelligence satellite systems and other military applications, as well as in analyzing data from telescopes.

Dr. XXX has become a leading expert on this subject, as evidenced by the rapidly growing number of citations to her work in this area. She has pioneered several novel approaches for constructing optimal tessellations, including multilevel and Newton-like techniques that have become the basis for many recent research initiatives both in the US and abroad. The development of highly efficient XXX-based algorithms is being widely recognized as one of the top most priorities in many engineering and scientific areas and is vital for a number of practical applications, as mentioned above. Take remote sensing for instance. The mobile robots spread out across certain area and share sensory information through an ad hoc wireless network, forming a mobile sensor network. Via effective positioning of the XXX as determined by Dr. XXX’s novel approach, it is possible to increase the area coverage and cooperation of these mobile sensor devices, which is of crucial importance in military and home security applications.

Dr. XXX, PhD, Professor of Materials Science and Engineering at XXX University, Director of XXX Industry/University Cooperative Research Center for XXXX and a Fellow of XXX (XXX) International states:

> Dr. XXX is a pre-eminent researcher in the field of applied mathematics emphasizing numerical algorithms, computational geometry and computational materials science. She has made outstanding contributions to the current understanding of complex systems which has broad and varied implications in the areas of computational geometry algorithms and automation of phase diagram calculation, to name a few. See Exhibit 05.

XXX, PhD, Professor of Materials Science and Engineering at XXX University, former Deputy Division Director at XXX Laboratory notes:

> I have been aware of Professor XXX's work and her pioneering research related to the development of novel statistical theories for grain boundary evolution…In addition to grain network evolution, some of her most exciting and groundbreaking current research includes the design of fast new algorithms for computational geometry and computational materials science… Prof. XXX has consistently developed new ideas and theories of XXX and XXX that are being extended to solve broader classes of nonlinear problems. See Exhibit 08.

Dr. XXX, PhD, founding Director of the Center for XXX and XXX at the XXX Laboratory, Professor of XXX Science at XXX University elaborates on Dr. XXX's "innovative" research in bio-inorganic nano based materials:

> These materials have direct bearing on the development of novel sources of alternative energy – such as photo voltaic and advanced fuel cells. Success in these areas will have **enormous economic consequences** as the US regains its economic advantage through its development of highly innovative science.
>
> …
>
> In addition to bio-inspired applications, these findings will directly benefit many other areas of technology and economy. For instance, it will aid in preventing crack growth in offshore oil-drilling platforms…**Dr. XXX's research makes an enormous contribution to this problem by supplying revolutionary mathematical modeling techniques**… See Exhibit 10 (emphasis added).

Dr. XXX writes:

> She [Dr. XXX] has clearly gone well beyond the scope of mathematical theories and has created her a reputation of an **irreplaceable expert in the interdisciplinary research**

> **community**. At times when scientists across the globe team up to find answers to the questions on which man's future as a species depends on and seek ways to create bridges between fields and disciplines, this reputation is clearly deserving of an outstanding researcher classification. See Exhibit 03 (emphasis added).

Dr. XXX, PhD, XXX of Science Professor of Mathematics and Director of the XXXX at XXX University writes the following about Dr. XXX's contributions:

> One of the foci of Dr. XXX's research is development of groundbreaking mathematical modeling techniques for materials science applications. To meet the increasing demands of society, industry needs to be able to produce highly sophisticated materials, often possessing very specific sets of properties to target particular applications, with the level of sophistication growing with the pace comparable to the rate with which humankind depletes Earth's natural resources.
>
> …
>
> Dr. XXX's numerous research findings provide a deeper understanding of materials parameters and their interaction across different scales. Armed with this information, scientists and engineers can develop precise, accurate techniques for controlling materials properties and designing highly sophisticated materials tailored to a particular application. See Exhibit 04.

The remainder of this letter will summarize the attached evidence in the following categories in accordance with 8 CFR § 204.5(i):

A. Evidence of the alien's original scientific or scholarly research contributions to the academic field
B. Evidence of the alien's authorship of scholarly books or articles in scholarly journals with international circulation
C. Published material in professional publications written by others about the alien's work in the filed
D. Evidence of an alien's participation, on a panel or individually, as the judge of the work of others in the same or allied academic field
E. Documentation of the alien's receipt of major international prizes or awards for outstanding achievement in the academic field
F. Documentation of the alien's membership in associations in the academic field which require outstanding achievements of their members.

A. EVIDENCE OF DR. XXX'S ORIGINAL SCIENTIFIC OR SCHOLARLY RESEARCH CONTRIBUTIONS TO THE ACADEMIC FIELD

Dr. XXX has made several outstanding contributions to the field of applied mathematics emphasizing numerical algorithms, computational geometry and computational materials science. She has made outstanding contributions to the current understanding of complex systems which has broad and varied implication in the areas of computational geometry algorithms and automation of phase diagram calculation. Other leading international experts in these areas hail Dr. XXX's work as cutting-edge research.

XXX, PhD, Professor of Mathematics and Director of the Center for XXX at XXX University, Korea writes:

> Dr. XXX's research is cutting-edge, outstanding and exceptional. Research scientists worldwide acclaim her pioneering research in the fields….**Her research is fundamental to the advancement of materials science in the United States**…**only few researchers in the world possess this unique expertise**... See Exhibit 07 (emphasis added).

Dr. XXX explains the significance of Dr. XXX's research:

> **Her most recent work** focused on microstructure evolution for which she has developed very innovative statistical theories that have hugely contributed to the understanding of interface dominated materials properties and of their control and optimization…this work **has important application to biological, medical, and chemical systems which underlie a variety of sectors of the US economy**. See Exhibit 06 (emphasis added).

Dr. XXX further explains:

> She has also recently made fundamental contributions to methodologies now in common use in computational geometry, statistical clustering, and adaptive computations…**The extremely fast computational algorithms for constructing these quantizations designed by Dr. XXX are now being incorporated into commercial codes in many leading research laboratories and R&D companies around the globe**. See Exhibit 06 (emphasis added).

XXX, PhD, Materials Research Engineer at XXXX writes the following about Dr. XXX's outstanding scientific contributions:

> Dr. XXX's research is devoted to developing, validating and improving mathematical models that describe complex materials systems…**Dr. XXX's ideas** of using adaptive mesh refinement together with global optimization strategies **have never before been used in materials science community** for constructing phase diagrams… See Exhibit 09 (emphasis added).

With regards to her research in the study of XXXX (XXX), Dr. XXX explains:

> **Dr. XXX has become a leading expert on this subject**…In recent works pioneered by Dr. XXX, some very important convergence results were discovered for the first time…the concept of XXX is already actively exploited in various military applications, like remote sensing….Via effective position of XXX generators as determined by Dr. XXX's novel approach, it is possible to increase the area coverage and cooperation of these mobile sensor devices, **which is of crucial importance in military and home security applications**. See Exhibit 02 (emphasis added).

Dr. XXX states:

> Dr. XXX joined the project [XXXX] as part of the Mathematics group led by Dr. XXX and quickly became a pioneering member of our team…She designed a novel state-of-the-art reduced complexity algorithm for phase diagram calculation based on adaptive critical point detection approach that became the model for the project's future investigations…we are now able to study many technologically useful materials with a much high degree of accuracy than before and explain what happens when they undergo various physical and chemical transformations. See Exhibit 05.

Dr. XXX writes:

> Dr. XXX's research is focused on the internal structure of polycrystalline materials, such as metals, ceramics or semiconductors, or the phenomena occurring at the interface between organic and inorganic parts in a biomaterial…Many interesting questions remain about the evolution of materials interface, which puzzled materials scientists and mathematicians for decades…Dr. XXX has developed the foundations of rigorous mathematical theory explaining these phenomena that gives a completely new perspective on the subject and will be of practical importance to engineers and scientists alike. See Exhibit 10.

B. EVIDENCE OF DR. XXX'S AUTHORSHIP OF SCHOLARLY BOOKS OR ARTICLES (IN SCHOLARLY JOURNALS WITH INTERNATIONAL CIRCULATION) IN THE ACADEMIC FIELD

Over the course of her career, Dr. XXX has contributed numerous papers to peer-reviewed journals of international repute in her field. Among the prestigious journals that have featured her work are *International Journal of Numerical Analysis and Modeling, SIAM Journal of Numerical Analysis, and SIAM Journal for Scientific Computing*, all of which are in circulation around the world. See Exhibit 14. Further, Dr. XXX's scientific articles enjoy numerous citations by other researchers in the field. Many researchers publish their findings in journals, but the citation of this work by others indicates that the research is not only relevant to the research initiatives in the field, but that it is widely-accepted, and that others find it worthy of incorporation into their own work. See Exhibit 16.

Dr. XXX writes:

> The ground-breaking nature of her work is further demonstrated by the acceptance of the results for **publication in several prestigious peer reviewed national and international scientific journals**, including the *International Journal of Numerical Analysis and Modeling* and *SIAM Journal for Scientific Computing*. See Exhibit 04 (emphasis added).

Dr. XXX states:

> …the new algorithm she [Dr. XXX] proposed in the first-author article entitled "*A New Algorithm for the Automation of Phase Diagram Calculation*" published in *Computational Materials Science* in 2006 has become a focus of attention in the materials science community…
>
> In another recent series of publications, including "*A new perspective on texture evolution*" and "*Towards a statistical theory of texture evolution in polycrystals*", **published in top applied mathematics journals**, Dr. XXX as a key researcher in a team of mathematicians and materials scientists has made several breakthrough discoveries concerning the development of texture in complex materials, which is of paramount importance in steel and other alloy manufacturing. See Exhibit 09 (emphasis added).

Dr. XXX notes:

> The groundbreaking nature of Dr. XXX's has been recognized by scientist across the globe, with the number of invited presentations she gave in the past two years **far exceeding that of any**

> **established scientist in the field**. Her publications were accepted to top research journals, including *Intl. J. of Num. Anal. And Modeling*, *SIAM J. Numerical Analysis*, *SIAM J. Scientific Computing*, along with many others…
>
> Dr. XXX was the key researcher of the work leading to all three of our recent articles "*On a statistical theory of critical events in microstructural evolution*", "*A new perspective on texture evolution*" and "*Towards a statistical theory of texture evolution in polycrystals*." See Exhibit 03 (emphasis added).

Dr. XXX says:

> Dr. XXX is a leading author of numerous articles published in prestigious peer-reviewed, high-impact journals… See Exhibit 07 (emphasis added).

Dr. XXX asserts:

> In recent works pioneered by Dr. XXX, **some very important convergence results were discovered for the first time**. These results are published in *SIAM Journal of Numerical Analysis*, **the leading research journal in the field**. See Exhibit 02 (emphasis added).

C. PUBLISHED MATERIAL IN PROFESSIONAL PUBLICATIONS WRITTEN BY OTHERS ABOUT DR. XXX'S WORK IN THE ACADEMIC FIELD

Given the groundbreaking nature of Dr. XXX's research, her work has been featured in major publications and media outlets several times. Her studies to the development of new algorithms and statistical theory of texture evolution were highlighted in *Computational Materials Science* and in other top applied mathematics journals. Indeed, Dr. XXX is renowned globally for her outstanding work. As an author of numerous articles in national and international peer-reviewed publications, her work is highly cited, indicating both that her research is highly relevant and that her findings have a positive impact on the works of others. That Dr. XXX's work has been showcased in the international journals and media are a testament to the cutting-edge nature of her work, and her global elite stature in her field.

Dr. XXX writes:

> An important contribution made by Dr. XXX is the automation of the phase diagram calculation for multicomponent alloy which has generated much interest in the scientific community…The work has

> appeared in the journal *Computational Materials Sciences*, and it was **one of the top downloaded papers on the journals website** indicating the importance and interest which is afforded to her research by fellow researcher/colleagues**.** See Exhibit 02 (emphasis added).

Dr. XXX says:

> Her publication on "Convergence properties of the XXX algorithm for computing the XXX" has a **citation score of 15** in its 2 years after publication, **which is extremely high for the field of applied mathematics, where the number of citations in the first year averages around 2 to 5**, which speaks of the high quality of Dr. XXX's work. See Exhibit 09 (emphasis added).

D. EVIDENCE OF DR. XXX'S PARTICIPATION, EITHER INDIVIDUALLY OR ON A PANEL, AS A JUDGE OF THE WORK OF OTHERS IN THE SAME OR AN ALLIED ACADEMIC FIELD

Dr. XXX has the distinction of being asked to review articles submitted for leading conferences, including, SIGGRAPH (International conference and exhibition on computer graphics and interactive techniques) and publications to leading international scientific journals, including, *CALPHAD*, *International Journal for Numerical Methods in Fluids*, and *Modeling and Simulation in Materials Science and Engineering*. Such prestigious invitations indicate the esteemed position that Dr. XXX enjoys within the scientific community. The fact that she is in a position to write reviews puts her in the upper tier of scientists within her field. The journals examine the publication records of reviewers carefully; the reviewer's task is not just to have an in-depth understanding of the subject matter, but to be able to put the new data into a larger perspective and to determine whether a significant contribution is made to the literature. See Exhibit 13.

In addition to reviewing articles for a number of world-renowned scientific journals, Dr. XXX also serves as a panel judge for Master and PhD students preparing their dissertations and mentor for undergraduate students.

Dr. XXX writes of Dr. XXX's leadership:

> Dr. XXX is a regular referee and peer reviewer for articles submitted to prestigious conference and journals in a variety of research areas. For example, I am aware that due to being an expert in computational geometry she was chosen to referee an article submitted to SIGGRAPH (International conference and exhibition on computer graphics and interactive techniques), which is the premier publication in the computer graphics community. **She also serves on the referee board for leading materials science journals *CALPHAD*, *International Journal for***

> ***Numerical Methods in Fluids*, and *Modeling and Simulation in Materials Science and Engineering***. She participated in several student committees at XXX and currently supervises one Master's and one doctoral dissertation at XXX, not to mention several groups of undergraduate research programs both at XXX and XXX. See Exhibit 08 (emphasis added).

Dr. XXX states:

> She [Dr. XXX] has a successful history of serving on many panels including a number of Masters and Ph.D. dissertation committees, and the Women in Sciences and Engineering colloquia. She has also mentored undergraduates, including women and minority students, at the XXX Summer Undergraduate Applied Math Institute. See Exhibit 04.

Dr. XXX points out:

> She [Dr. XXX] has co-authored a review publication on the subject of XXX diagrams and applications and organized several very successful XXX on the subject, **which brought together most prominent researchers from around the globe**. See Exhibit 07 (emphasis added).

E. DOCUMENTATION OF DR. XXX'S RECEIPT OF MAJOR INTERNATIONAL PRIZES OR AWARDS FOR OUTSTANDING ACHIEVEMENT IN THE ACADEMIC FIELD

Because of the significance of her research, Dr. XXX has been the recipient of highly competitive international fellowships as well as several national awards and grants. She has won several awards at professional meetings and conferences for her presentations. Research scientists around the world have lauded her pioneering research, including such prominent research centers as INRIA, Sophia-Antipolis (France), XXX University (Korea) and XXX University (Russia) among others. Dr. XXX's achievements in applied mathematics are widely recognized throughout the international community. See Exhibit 11.

Dr. XXX notes:

> …she [Dr. XXX] has been **awarded first prize** at the XXX Research conference on Physical Metallurgy, which has been the **first time this kind of award has been bestowed** by this engineering research Conference committee **to a mathematician**, not mention the fact she was the first female mathematician to get the award. See Exhibit 10 (emphasis added).

Dr. XXX reinforces the significance of the award received at the XXX Research Conference:

> In 2006, she was one of a few mathematicians invited to the prestigious XXX Conference on Physical Metallurgy, held in Portsmouth, NH, and won the Best Poster Award, which attests to the recognition of her work not only by mathematicians, but also by materials scientists and engineers. See Exhibit 08.

Dr. XXX additionally states:

> …she pioneered an approach never used before and generated huge interest from the community due to the robustness and computational efficiency of her model. The outstanding quality of this work has been recognized by awarding her the Honorable Mention at the prestigious Copper Mountain conference on Domain decomposition methods, **an honor which is bestowed only to a few selected researchers worldwide, once a year**. See Exhibit 07 (emphasis added).

F. DOCUMENTATION OF DR. XXX'S MEMBERSHIP IN ASSOCIATIONS IN THE ACADEMIC FIELD WHICH REQUIRE OUTSTANDING ACHIEVEMENTS OF THEIR MEMBERS

Dr. XXX was awarded membership in a nation-wide selective network of XXX fellows. XXX is a professional development program of the Mathematical Association of America, with major funding provided by the XXX Foundation. The program is highly competitive with only seventy positions available each year for eligible members in the US and Canada. In addition to XXX membership, Dr. XXX is also a member of the Society of Industrial and Applied Mathematics, the American Mathematical Society, and the Computational Materials Science Network. See Exhibit 12. Dr. XXX's membership in these numerous associations for mathematics demonstrates that she is an outstanding researcher who has received worldwide renown for her work.

CONCLUSION

Dr. XXX clearly meets all six of the requirements under 8 C.F.R. § 204.5(i) that qualify her as an outstanding researcher or professor. She has been internationally recognized as outstanding in her field as evidenced by meeting all six of the criteria listed in 8 C.F.R. § 204.5(i)(3)(i). Petitioners for outstanding professor or researcher need only meet two of those six listed criteria in order to prove that they have received international recognition for their work. Hence, the level of international acclaim that Dr. XXX's work has received surpasses the level that is statutorily required. In addition to the international recognition requirement, Dr. XXX also has the level of teaching

experience that is required in 8 C.F.R. § 204.5(i)(3)(ii) and has an offer for a tenure-track teaching position in the U.S., as required by 8 C.F.R. § 204.5(i)(3)(iii).

Based on the foregoing facts, Dr. XXX hereby requests that you approve this permanent resident petition, at your earliest convenience, to allow her to remain in the U.S. so that he can continue her outstanding work as a professor in the Department of Mathematical Sciences at XXX University.

Sincerely,

Attorney at Law