PREFACE BY EDITOR OF THE JOURNAL OF INNOVATIVE MATERIALS IN EXTREME CONDITIONS (JIMEC)

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We are all aware that the climate is becoming more extreme, with the seemingly neverending current series of natural disasters providing a preview of a future of extreme weather conditions. While "extreme" is a relative measure of the state of a system and must always be compared to a "normal" state, it is clear that our modern infrastructure is being challenged by the exposure to extreme conditions that had previously been limited to small regions of our planet (extreme cold at the poles, extreme heat in the deserts, volcanoes, high pressures in deep ocean trenches, etc); similarly, we are faced with learning about and exploring the extreme conditions of the inner Earth or outer space. Over the years scientists have begun research to invent materials sustainable under extreme conditions. Furthermore, such innovative materials explored at high pressures, under high magnetic and electric fields, over a wide range of temperatures, radiation conditions, corrosive environments, under extreme mechanical loads, and non-equilibrium thermodynamic conditions are applicable not only in e.g. deep ocean explorations or space travel, but become increasingly relevant in our daily life, such as in applications to energy production and conversion, maintenance of the water supply, or the stability of the computer infrastructure under coronal mass ejections. By searching the Web of Science (WoS) database using the keyword "extreme condition", one reaches more than 70.000 publications. This, of course, includes environmental sciences, geosciences, engineering, materials science, etc, and Figure 1 shows a graph with the growing field of research on systems under extreme conditions in the past 20 years.

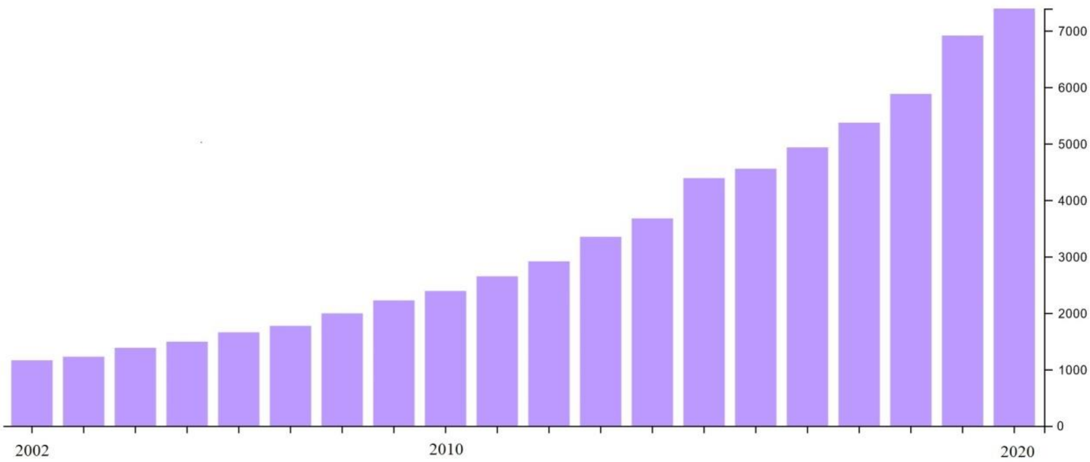

Figure 1. Graph showing the growing field of research under extreme conditions in the past 20 years obtained by searching the Web of Science (WoS) database using the keyword "extreme condition".

Theoretical studies and methods are especially important in the field of materials under extreme conditions, applied independently, or as a complement to experimental research, due to the limitations of experimental methods under extreme conditions. The field of energy landscapes of chemical systems and materials constitutes one of the most important theoretical foundations for the investigation and design of materials, with more than 30.000 publications found in the WoS database. Similar to the field of research on extreme conditions, the study of energy landscapes is a rapidly growing field of research (Figure 2) and includes contributions from and applications to mathematics, computer science, physics, chemistry, biology, environmental sciences, engineering, and materials science.

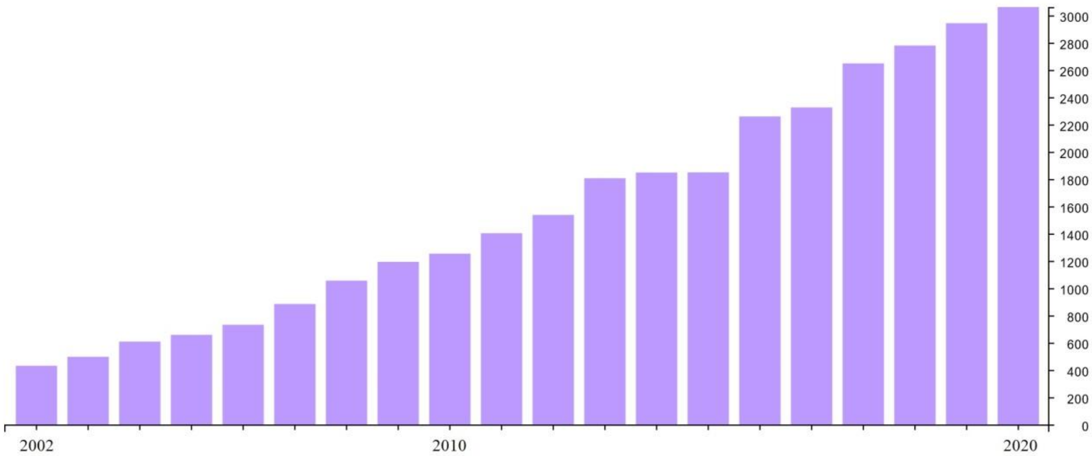

Figure 2. Graph showing the growing field of research on energy landscapes in the past 20 years obtained by searching the WoS database using the keyword "energy landscape".

However, when the keywords "energy landscape" and "extreme conditions" are combined, there are only 233 publications available in the WoS database. Although the number of publications is growing at a steady pace and "energy landscapes under extreme conditions" constitutes a promising new field of research (Figure 3), there exists no comprehensive study on the energy landscapes of materials under extreme conditions so far, and the proper way(s) to incorporate extreme conditions into the energy landscape approach is just beginning to be explored. Therefore it is my great pleasure to introduce a publication by a world expert on energy landscapes, Prof. Dr. J. Christian Schön, entitled "Energy landscape concepts for chemical systems under extreme conditions", which is being published as a highlighted article in an individual volume of JIMEC. Currently, Prof. Dr. J. Christian Schön is a senior scientist at the Max Planck Institute for Solid State Research in Stuttgart (Germany), and a professor at the Rheinische Friedrich-Wilhelms-University in Bonn (Germany). A short biography is found below; for more information, including a full list of publications and teaching details, contact information, etc., please visit Prof. Schön's official web pages:

www.chemie.uni-bonn.de/ac/schoen and https://www.fkf.mpg.de/person/31475/5017348, or contact the JIMEC journal: http://jimec.edu.rs/contact/ .

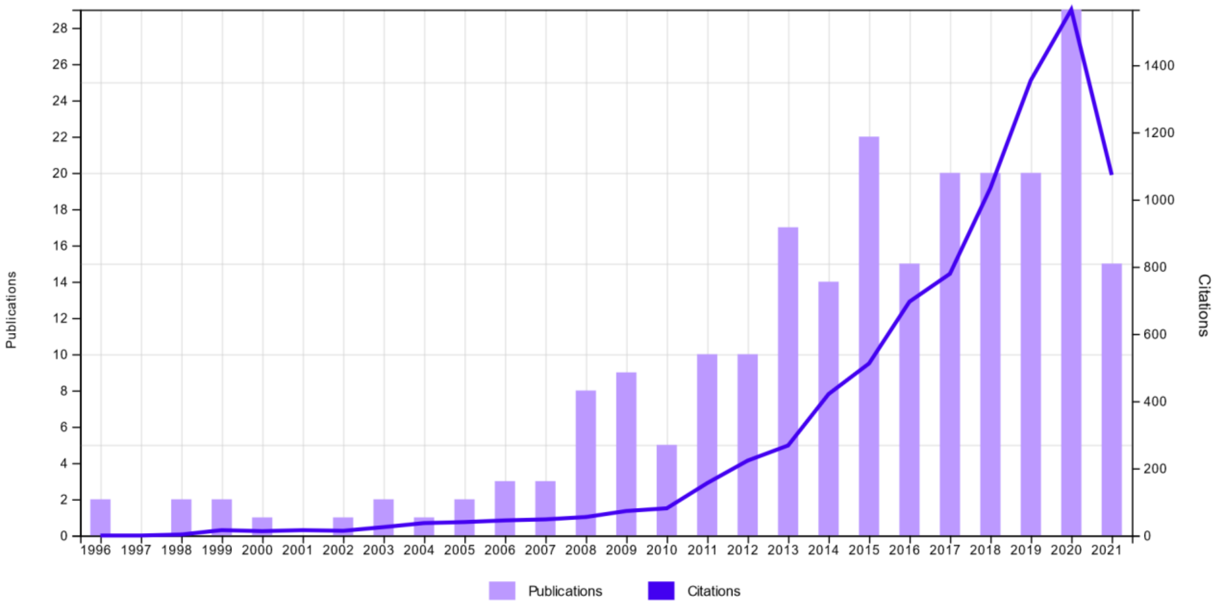

Figure 3. Graph showing the growth of the new field of research on energy landscape under extreme conditions, for the past 25 years, obtained by searching the WoS database (citations and publications) using the combined keywords "energy landscape and extreme condition".

Short CV

Prof. Dr. J. Christian Schön was born in Bonn (Germany) in 1957. After undergraduate studies in physics at the Rheinische Friedrich-Wilhelms-University in Bonn (Germany) from 1977-1980, he did his graduate studies in physics at the Massachusetts Institute of Technology in Cambridge (USA), where he obtained his M. S. in mathematical physics in 1982, and his Ph. D. in theoretical solid-state physics in 1988. From 1988-1991, he was a lecturer and post-doctoral fellow in the department of mathematical sciences at the San Diego State University in San Diego (USA). Next, he was a research scientist in the department of physics at the Niels Bohr Institute of the University Copenhagen in Copenhagen (Denmark) in 1992, and in the department of chemistry at the Rheinische Friedrich-Wilhelms-University in Bonn (Germany) from 1993-1997. After his habilitation in 1997, he was assistant professor in the department of chemistry at the Rheinische Friedrich-

Wilhelms-University in Bonn (Germany) from 1997-1999. He then joined the MPI for Solid State Research in Stuttgart (Germany), first in the department for solid state chemistry of Prof. Dr. M. Jansen (1999-2012) and subsequently in the department for nanosciences of Prof. Dr. K. Kern (since 2013). Since 2008, he has been a professor (apl) in the department of chemistry at the Rheinische Friedrich-Wilhelms-University in Bonn (Germany). In addition he has been guest researcher in the department of physics in the University of Southern Denmark in Odense (Denmark) in 1991 and 1997, and guest professor at the Laboratoire d'Analyse et d'Architecture des Systemes (CNRS) in Toulouse (France) in 2014.

Prof. Dr. J. Christian Schön has published over 130 scientific papers in international refereed journals from the SCI list, with over 3400 citations (*h*-index=33, Scopus) and over 5400 citations (*h*-index=39, *i10*-index=106, Google Scholar), several book chapters in edited books, and over 100 other scientific publications. He has presented many invited lectures from his field of expertise at international and national scientific meetings and universities, he has been a reviewer for many different international scientific journals, and has been an evaluator of a number of international scientific projects. Prof. Dr. J. Christian Schön has been highly engaged in the training and formation of future scientists by guiding the research of numerous M.Sc. and Ph.D. students, post-docs, and young guest researchers. For the past 25 years, he has organized many conferences, in particular regular meetings in the field of energy landscapes, bringing together researchers on energy landscapes from chemistry, physics, applied mathematics, computer science, biology, and engineering. He is a member of the Royal Society of Chemistry, American Physical Society, Materials Research Society, Deutsche Physikalische Gesellschaft, New York Academy of Sciences, and the Deutsche Kristallographische Gesellschaft.

Prof. Dr. J. Christian Schön's main research areas are the theory of complex multi-minima-energy landscapes, the development of new computer algorithms for the exploration of energy landscapes, and their applications in chemistry such as prediction of molecular structures and clusters in vacuum and on surfaces, and the prediction and modelling of metastable crystalline materials and of amorphous materials, computing their properties, and simulating and optimizing their synthesis, employing techniques from the area of global optimization, MC and MD simulations, optimal control and finite-time thermodynamics.