Israeli Society for Clay Research

Clay Research NewsLetter

Issue 1

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שנה טובה!

Happy Rosh Hashana fellow clay researchers, This last year has been a peculiar one, to say the least. The Covid-19 health and social challenges have affected all of us to some extent. Still, these obstacles can bring with them opportunities and possibilities that were previously overlooked: Online international seminars and conferences, flexible working hours and an opportunity for reflection.

In this respect, our small tight knit scientific society offers many advantages, such as strong personal connections and the inside track to the different disciplines within the clay field. Our society has over 40 members from several research institutions and varied scientific fields, including geology, environmental science, material science, biotechnology, water and soil sciences, and chemical engineering. I would like to build on this diversity and our personal connections to improve the research we do and our international visibility. To that end, we have launched a new webpage on the AIPEA website: https://israel.aipea.org/. The webpage will be updated periodically with announcements, and job postings and other topics of interest. In addition, we are working on a spring workshop dedicated to displaying the different areas of our research. We already have two proposed topics that will be covered, the first dealing with FTIR surface characterization of clay-based materials (headed by Prof. Rytwo) and the latter

Dr. Adi Radian

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dealing with the use of isotopes in clay research (Headed by Dr. Zaarur). Please feel free to contact me with more ideas for relevant and interesting topics. The workshop will also encourage student participation and there will be time allotted for student poster presentations.

I hope to see you all there.

Lastly, I would like to welcome our new members: I wish you all the best and hope you will find this society a valuable resource. Let us all use this platform to create new and meaningful collaborations by merging the classical and the emerging areas of clay research.

I wish you all a happy, healthy, and fruitful new year.

SHANA TOVA!
Adi

Dr. Adi Radian
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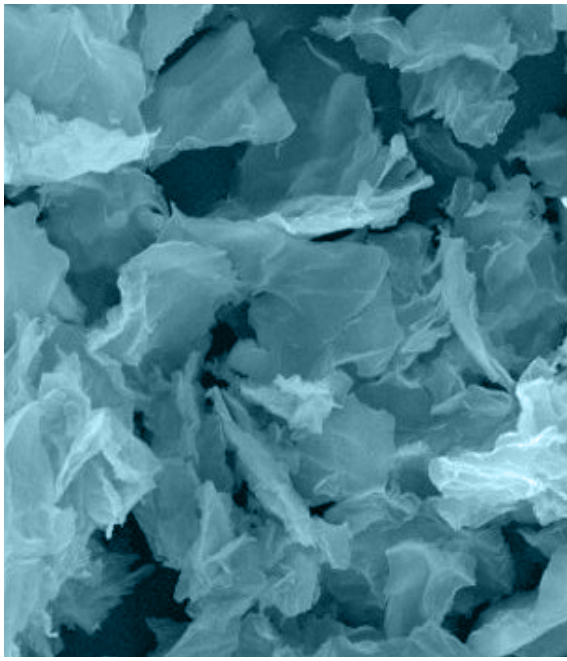

Insights of a former Israeli Clay Group President

After about three years, I am leaving the position to Dr. Adi Radian. Adi kindly asked me if I have some insights about our research group and its importance.

I have been a member of the group since approximately 1990. While trying to summarize our activity since then, I think that all former and new members will agree that we have always been a very small group. The focus of the group, as in other clay-groups, has changed constantly according to the "trends" along the way. From eminent researchers dealing with clay mineralogy, clay formation, rheology influences and colloidal properties (while taking the risk of forgetting more than one, I must mention Heller-Kalai, Nathan, Deutsch, Banin, Singer, Yariv and many others), to an era where the "fashion" deals with more environmental or practical issues such as drug-delivery, nanomaterials, water treatment, catalysis, and pollutant remediation (again- I should apologize a-priori from those I forgot… Nir, Mishael, Radian, Borisover, Gerstl…). Amir Sandler used to label the latter researchers as "clay users and abusers" based on the modifications those researchers perform on the pristine minerals to adapt them to the use-in-case.

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As I mentioned, we were always a small group. Since I remember, we always struggled for our existence as a unique research group on one hand, while trying to "get bigger" on the other hand. We talked during the years about merging probably with Soil Science or Geology researchers. And along the way we still managed (and some of us may indeed think is a mistake) to remain as a separate group.

Since I consider part of "my mission" to try and be an educator, I am convinced that clays and clay minerals teach us a lot: geology, chemistry, physics, and even biology. But also about versatility, adaptability, possibility to change and be changed, environmental importance, industrial applicability and more.

Most people don't know that we can find clays almost everywhere, from food to airplanes; that clays are, and always were "nano" - millions of years before the term "nanotechnology" was invented. Clays offer us versatility in any place we need something that delivers vast influence, using a small amount of tiny particles, and at a very low price.

So- Adi, keep pushing this cart forward and up. Clays have a great past- but also still a wonderful and promising future. As I can imagine the first potter changing the course of history thousands of years ago, and the first hybrid clay-organic scientist changing the face of material sciences decades ago, so I can dream about some young researcher using smart modifications and changes on clays to solve all the planet's problems – from efficient and cost effective medicine, to climate change, to topics that I am even not able to imagine.

Come on, join the winning team!….Come and study about clays!

Giora

Professor Giora Rytwo Ph.D

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Spotlight

on our current and future post-docs

Dr. Maya Engel

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https://mayaengel.wixsite.com/mayaengel

Maya Engel, Standford

"I am interested in the underlying mechanisms that drive the fate and behaviour of contaminants in the environment, with a special focus on the contribution of organic matter to contaminant fate. My goal is to advance our understanding of the biogeochemical processes that control contaminant mobility and availability in the environment. This is crucial for the scientific community to develop strategies to adapt and mitigate the effects of soil and water pollution."

Dr. Engel completed her bachelor's degree in Chemistry at the Tel Aviv University in 2012. She then continued to a direct-track Ph.D. in Environmental Chemistry under the supervision of Prof. Benny Chefetz at the Department of Soil and Water Sciences at the Hebrew University of Jerusalem (graduated in 2018). Dr. Engel first explored the mechanisms in which dissolved organic matter interacts with carbon-based nanomaterials and then investigated how these interactions influence the binding of organic pollutants. Finally, Dr. Engel examined the antibacterial properties of a reusable composite material made of carbon nanotubes and magnetic iron oxides.

In early 2019 Dr. Engel commenced her postdoctoral studies in Soil and Environmental Biogeochemistry under the supervision of Prof. Scott Fendorf at the Department of Earth System Science at Stanford University. There she studies the mobility and speciation of heavy metals in intricate soil systems with an aim to decipher the mechanisms of heavy metal retention. Her research projects are specifically focused on: 1) How natural organic compounds influence heavy metal binding to iron minerals; 2) How is heavy metal mobility in soils affected by spatial redox heterogeneities and 3) How does the formation and stability of natural colloids impact heavy metal speciation and availability.

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Spotlight on our current and future post-docs

Maoz Dor, Oregon State

"I am interested in the complex structural assembly phenomena in soils at the nano to macro scales. I aim my attention at understanding the physical, chemical, and biological mechanisms dominating soil structure dynamics, by harnessing innovative imaging technologies and computation to expand our knowledge."

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Maoz studied on the direct Ph.D. track at the soil and water department at the Hebrew University of Jerusalem, under the supervision of Prof. Yael Mishael and Prof. Simon Emmanuel. He has recently submitted his Ph.D. thesis entitled "Characterizing Changes in Soil Structure from the Nano to Macro Scale: Agricultural and Environmental Implications". Maoz first explored the effect of microstructural changes in soils induced by wetting and drying on pesticide mobility. Next, he investigated the effect of mineral structure and ionic strength on the assembly of clay-mineral platelets, tactoids, and aggregates.

Maoz will start his postdoctoral project entitled 'Bridging Microbial Activity and Soil-Structure Development to Elucidate Mechanisms Governing Soil Architecture' at the department of environmental engineering at Oregon State University, under the supervision of Prof. Dorthe Wildenschild. He will be studying the distribution and availability of nutrient sources, aeration, and hydration dynamics, and how these factors shape microbial distribution within soil aggregates and porous systems. More specifically, he plans to manipulate the microbial community by employing a soil amendment with low/high C:N and quantify (using 3D imaging) the subsequent effect of microbial activity on soil structure.

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Itamar Shabtai, Cornell

"I study how abiotic and biotic processes affect natural and anthropogenic organic compound cycling in soil and water environments, and how human and natural perturbations influence these linkages. To obtain conceptual, molecular scale understanding of organic compounds in soil and water ecosystems, I study their chemical interactions at mineral-organic interfaces".

is288@cornell.edu

Dr. Itamar Shabtai completed his BSc, MSc and PhD diplomas in soil and water sciences at the Faculty of Agriculture of the Hebrew University. His MSc research, conducted at the Agricultural Research Organization, the Volcani Center, focused on how land use and land cover change soil structure and hydraulic properties of clayey soils (Vertisols). During his PhD (graduated 2018), Itamar developed regenerable polymer-clay nanocomposites for pollutant adsorption from treated wastewater. Focusing on composite-pollutant interactions, composites were tailored to specifically remove micropollutants from solutions containing background organics. Composite regeneration was obtained by using polymers with tunable affinities in different solution chemistries.

After completing his PhD studies, Itamar continued as a postdoctoral associate in Prof. Johannes Lehmann's group at Cornell University. There, he expanded his research interests by investigating the mechanisms that shape soil organic matter formation and persistence. His projects focus on 1) the interaction of soil mineralogy and microbial activity on organo-mineral mechanisms and soil organic matter stabilization, 2) linking soil properties, microbial community diversity and organic matter chemistry on a continent-scale, and 3) applying in-situ ATR-FTIR spectroscopy to investigate the dynamics of rhizosphere carbon chemistry and its interactions with soil minerals.

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Shani Avneri , Hebrew University

My research interests are environmental chemistry and specifically, surface chemistry of soil and minerals and organo-mineral complex formation.

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I completed my B.Sc in chemistry in Ben-Gurion University on 2009, where I also completed my M.Sc in the water department in the Zuckerberg institute for water research. I was working on the implementation of antimicrobial polymers onto the surface of Reverse osmosis membrane to reduce biofilm formation. I was interested in dwelling into the world of environmental science and so I focused my research to soil chemistry in the soil and water department at the Hebrew University. My research was focused on the adsorption and interactions of dissolved organic matter from composted biosolids with agricultural soils and minerals in order to provide new molecular insights into the accumulation and stabilization of all water-soluble organic matter by mineral soils.

I completed my PhD during a family relocation abroad, and recently returned to the soil and water department as post-doctoral researcher. I am involved in a project investigating organic matter transformation and sequestration at soil mineral surfaces. This project is expected to provide important insight into organo-mineral association and by that into soil formation.

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Results of SEM competition

This year we had a Scanning electron microscope (SEM) image competition featuring clays, clay based composites and oxides taken by graduate students. The images were judged based on the level of the images, creativity, and relevance to the competition. We would like to thank Dr. Einat Zelinger from the Faculty of Agriculture core facility (HUJI) and Assistant Prof. Tamar Segal-Peretz from the Faculty of Chemical Engineering (Technion) for judging the competition.

Maoz Dor

1st Place

Maoz Dor, Faculty of Agriculture, Food and Environment, HUJI

Montmorillonite in salt: Cryo-SEM image of Montmorillonite aggregate in NaCl solution (100 mM). Imaged by:Jeol 7800 HR-SEM, coupled with quorum PP3010T cryo-preparation apparatus

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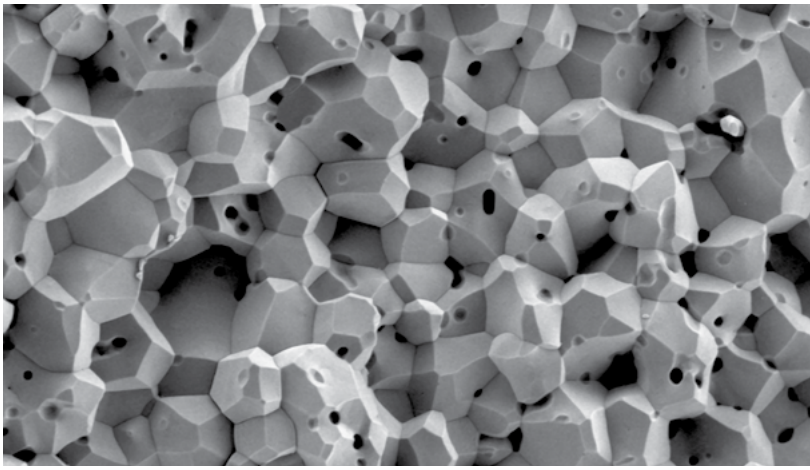
Results of SEM competition

Li-or Cohen

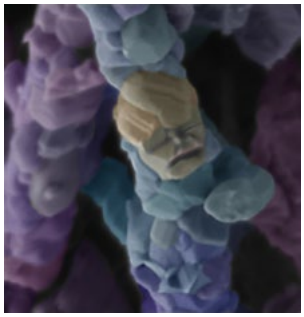
2nd Place

Li-or Cohen, Faculty of Material Engineering, Technion

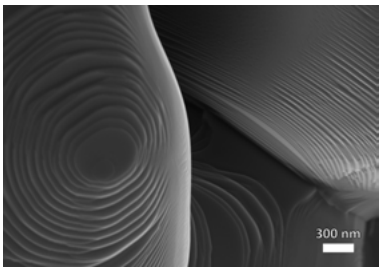


Rapid Sintering: The secondary electron micrograph was taken by Zeiss Ultra-Plus HRSEM microscope. The micrograph shows the microstructure of undoped alumina fabricated by slip-casting and rapidly sintered at 1a600 C for 3 minutes. The final body resulted in a relative density of 92%.

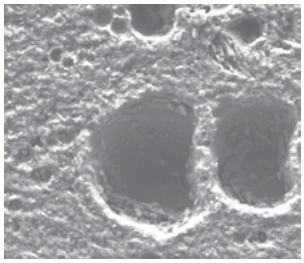
Outstanding SEM images:



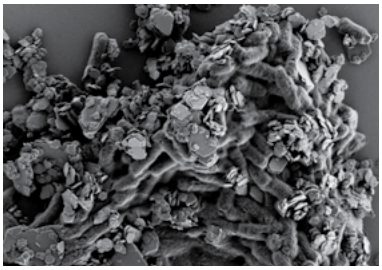
Crying baby-Nano,
electrospun TiO2 nanofibers after thermal treatment.
Oren Elishav, Technion.



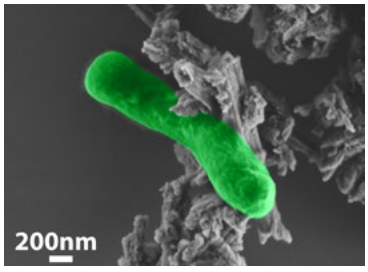
The surface of polycrystalline Y-doped Ca_2MnO_4 for thermoelectric energy conversion
Amram Azulay, Technion.



Minerals in fossils.
Clay minerals inside and above the intra-micro-fossil (foraminifera) poros.
Yair Gordin, Ben Gurion



Kaolinite clay embedded in E.coli biofilm (curli).
Nirrit Dana Cohen, Technion.



Caught in nanoclay:
E. coli cell captured by antibody functionalized etched Halloysite nanotubes.
Ofer Prinz-Setter, Technion.

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Upcoming Conferences

1. CMS202, 57th Annual Meeting of the Clay Minerals Society
   DATES: OCTOBER 18-23, 2020, VIRTUAL
   http://www.clays.org/57thAnnualMeeting.pdf

2. AIPEA, XVII INTERNATIONAL CLAY CONFERENCE – ICC 2021
   July, 12th -16th, Istanbul, Turkey
   https://icc.aipea.org

3. 3rd European Mineralogical Conference
   August 29th – September 3rd, 2021 Krakow, Poland
   https://emc2020.ptmin.eu/