CERAMIC TECH CHAT

Episode 12

Title – "Ceramics in Thailand: Rattikorn Yimnirun and colleagues (E12)"

INTRO

De Guire: "I'm Eileen De Guire, and this is Ceramic Tech Chat.

> Though we are called The American Ceramic Society, nearly 40% of our members are located outside of the United States. Because many of ACerS large conferences take place in the United States, it can be difficult for our international members to connect with their colleagues in the community. Fortunately, ACerS International Chapters offer members a way to connect with each other in their local region."

Yimnirun: "I'm acting as the chair of the ACerS Thailand Chapter. We hope that our society would become a crucial part in integrating different fields of people and making this large impact to the Society. It's a difficult job, but I think somebody has to do it, and we are willing to do it."

De Guire: "That's Rattikorn Yimnirun, dean of the School of Energy Science and Engineering at Vidyasirimedhi Institute of Science and Technology in Rayong, Thailand. Rattikorn, along with his colleagues Naratip Vittayakorn and Jakrapong Kaewkhao, cofounded the Thailand Chapter of ACerS in 2019.

> What does it take to establish an ACerS International Chapter? And what roles do Rattikorn and his colleagues see the Thailand Chapter playing in the country's local ceramic community?"
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> (music)

SECTION 1

De Guire: "As founders of ACerS Thailand Chapter, it's no surprise that Rattikorn, Naratip, and Jakrapong specialize in ceramic and glass research. However, the specific field of research that each specializes in is quite different."

Kaewkhao: "I am Jakrapong Kaewkhao. I am the vice president of the ACerS Thailand Chapter. I am the professor of physics and head of the Center of Excellence in Glass Technology and Materials Science in Nakhon Pathom Rajabhat University.

> I am working on glass science, especially on the new glass system for optical materials. As you know, in theoretical, glass is 100% recyclable. But sometimes we will not recycle this because sometimes recycling cost is more expensive. So, that's why we work on

glass. Not only the recycling system, we also develop glass for new materials like radiation detectors, laser medium system, and some optical amplifiers."

De Guire: "Okay. Is there a large glass industry in Thailand?"

Kaewkhao: "Thailand is a big glass industry in ASEAN [Association of Southeast Asian Nations]. So we have the two or three biggest companies to produce glasses, not only glasses, window, also."

De Guire: "Okay, interesting."

Kaewkhao: "And very important now for in this area."

De Guire: "Right. Not just for construction but display glasses and other."

Kaewkhao: "Construction also, yeah, construction also. Bottle decoration, many glasses is also produced in Thailand and exported to the ASEAN."

De Guire: "Okay, great. Rattikorn, can you talk to us a little bit about your research and why it's important, how it will make a difference?"

Yimnirun: "Actually, you know what, in the past 30 years or so, I've been working on functional ceramics. In particular, in the past decade or so, I've been working specifically on advanced characterization using the synchrotron techniques. So even though I work on different areas, as I mentioned, past 10 years, I've been working on using this synchrotron facility in Thailand. It's very important because in ASEAN countries there are only two synchrotron facilities, and one of the two is in Thailand. So that's why I moved to work in this specific area because I believe that the synchrotron facility would advance our research in this glass and ceramic area for industrial application and for other applications."

De Guire: "So in the United States, it can be very challenging to get time on a synchrotron. Do you have that problem in Thailand also?"

Yimnirun: "Actually in Thailand, I would invite anyone to come to use the synchrotron facility in Thailand because it's not that difficult to get the beam time for synchrotron. Actually, I'm really lucky that I'm actually the one responsible for taking care of one of the beam lines, so I have very good access to the beam line. So it's been very fortunate.

Surprisingly, the Thai government is investing in this synchrotron facility. They are building the second synchrotron facility just right in the backyard of my university. It's right in the middle of the EECi area, it's very important."

De Guire: "Oh, absolutely. That's a really fundamental tool and extremely powerful tool, so yeah, having that much access to it is really pretty amazing. I know many scientists here in the United States would be envious to hear."

Yimnirun: “I actually have friends in the U.S. who have been collaborating with to use their samples to do some characterization here. So, as I mentioned, I’m very open to any collaboration with any of the colleagues around the world if they would like to use the synchrotron facility.”

De Guire: “Well, I’m sure you’ll be hearing from some after they hear this podcast. So, Naratip, would you briefly tell us about your research activities and what the impact of them are.”

Vittayakorn: “Okay. I’m a professor of materials science at King Mongkut’s Institute of Technology Ladkrabang. Right now I’m working on the hybrid piezo-triboelectrics nanogenerator. This kind of generator is the new triumph of energy harvesting technology. This kind of generator can harvest mechanical energy from living environment and convert them into electricity. And as we know, there are several energy harvesting technologies. Some of them use the energy harvesting material, like solar cell technologies use the semiconductor like silicon to convert solar energy into electricity. But the thermoelectric material can be used to convert the difference between the temperature into electricity. And also mechanical energy can be converted to electricity by using the piezoelectric materials.

However, there are several pain points on this technology. So for example, the piezo materials are ceramics, and they are not flexible. And it’s quite difficult to apply them to some applications. For example, wearable devices. And the fabrication costs of the piezoceramic is not cheap. Most of them are synthetic materials, and optimal performance is still not good enough for the application. So in our work, we combine piezo materials with triboelectric effects. So we use the piezo material, especially piezoceramics, we make the composite from piezoceramics mixed with polymers to make it flexible and use it in the triboelectric nanogenerators. So the working principle is based on three fundamental effects. First one is the piezoelectric effect, and second one is the triboelectric effect, and electrostatic induction.

De Guire: “Wow, that’s really very interesting and really multidisciplinary also in terms of marrying together materials science and mechanical engineering, energy engineering and science.”

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SECTION 2

De Guire: “You mentioned the ASEAN countries a couple of times. Is there much collaboration between them? It’s a large region but populated with some smaller countries. So, how’s that work?”

Vittayakorn: “Well at the moment, as far as I understand, there are attempts to put together this collaboration between ASEAN countries, but so far I don’t think they’ve been that successful yet. So, that’s why we tried to form this organization with ACerS. We’ve been

trying to foster this Asia-Pacific ceramic collaborations to bring together people from the ASEAN countries to sit around and talk and how we can collaborate more."

De Guire: "Yeah, it's important to point out that all three of you are founding members of the new American Ceramic Society Thailand Chapter. Can you tell me how, about when you established it, and how many people belong, and what are some of the activities that you've been engaging in."

Yimnirun: "Okay, I'll just give the brief introduction about it. So, we have the Thai Ceramic Society. It's been established for quite some years. And then we have the work on this materials research and also ceramic research for the past more than 30 years. Unfortunately, I think we were not well organized. So about five years ago, we came together and then we thought that maybe, to actually put us on the map, maybe we should have the society that represents our research in Thailand, so that people outside Thailand would notice more how we come together and the quality of the research that we are working on in Thailand. So you know what, we started from about five or six years ago, we started putting together the Materials Research Society of Thailand. So, we started from there, and then it's become large.

And then as myself, I was educated with my degrees in ceramic science from Penn State, so I said maybe my area of expertise is actually in ceramic science, and also the two young men here, they also are in ceramics and glass. So, we came together again and said maybe we should also try to start this society, The American Ceramic Society Thailand Chapter, because The American Ceramic Society is the biggest society in terms of ceramics in the world, so maybe we try to bring it up. Of course, we got connected with the help of professor Amar Bhalla and also the past president, Dr. Tatsuki Ohji. I actually went to Japan to meet up with him, then I met him two years ago in 2019 in Oregon, during the MS&T meeting in Portland. So we sat down, and we talked, and then we said we would like to establish this society."

Kaewkhao: "Our main purpose, we have three main purpose. The first one is we want to build a community of ceramics and glass people. Like people can talk about ceramics or people can share their experience or research. And we need a database of people that work in this field and what kind of materials that they work, what are they interested in. And finally, we want to connect the academic people and industry people in term of research collaborations. Yeah, it's the three main purpose."

De Guire: "And what kinds of activities are you doing or have you done or have planned to make that happen? To meet those goals."

Yimnirun: "We actually had planned to have both the professional meetings and activities as monthly activities, and we focus more also on student activities. That's why in our chapter, we have 13 different divisions. Of course, we follow the ACerS U.S., and the two divisions that we also very much focusing on is, one is Student Activity Division, and another one is Young Professional and Educational Division. So we try to get people more involved in every level. Not only researcher, not only student, but also industrial partner.

And we have already two division activities on glass and optical materials, GOMD. Can Jakrapong provide more details on that?"

Kaewkhao: "Okay, thanks, Rattikorn. So, last year, we have two GOMD meetings. The first is start in August, fall meeting. We have about 60 or 70 people attend in our first meeting. This is on-site meeting. We start some social media and group in social media to connect with each other for research, for other activities, and for our students can enjoy in glass research. And also, we have just two weeks later, we have GOMD workshop in my university for one week. And we had around 30 people to attend. Actually, we have three times, third time in the SMARTMAT conference, we have the special seminar on glass scintillators. This is a special material for radiation detection using glass materials. So, say we have three activities in the last year. And we have two activities planned in this year for GOMD meeting already."

Yimnirun: "Yeah, let me give more details. Since the beginning of this chapter, we planned to have the grand opening for the chapter in the beginning of March. We planned an activity, but all of a sudden, the COVID-19 happened so we had to cancel that meeting.

So, the first big meeting, the conference that we had, was this SMARTMAT@2020 in December. So it's a hybrid meeting, but we have 600 people, more than 500 on-site and maybe about 50 from abroad, they are attending online. So that's the first big meeting for us. And later this year, actually in December this year, we also planned another big conference by ACerS Thailand Chapter. That, of course, is the annual meeting. But as Jakrapong mentioned, we also try to have divisional meeting, either online or on-site, for different division.

For Educational Division and also that Young Professional and Student Division, they came up with this idea of making a survey, we try to understand the education situation in Thailand in term of materials research. So, we hope that we will make a summary of this and then report on our Facebook and also website. You know, we got very interesting data. Maybe this survey will change. It's ongoing survey, so maybe every six months we will report this survey so that people, and especially students, will understand more about the situation of the ceramic industry in Thailand.

And so far, you have asked how many people. In our social group, at the moment we have more than 170 people as a group member. And we certainly hope that these members will join ACerS as an ACerS membership. There are so many different benefits from joining ACerS, so there are so many different categories for different kinds of members. So we are trying to tell our members to join ACerS in that sense."

De Guire: "Well that sounds great, like you have a lot of energy behind your group. So, very exciting, we're really excited to see where this goes and how it develops and builds out."

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BREAK

De Guire: “ACerS eleven International Chapters offer a way for our international members to connect with each other through regular technical, educational, and professional events and networking opportunities. Learn more about ACerS International Chapters at ceramics.org/internationalchapters.”

SECTION 3

De Guire: “Why don’t we talk a little bit about the ceramics industry in Thailand? Can you tell us a little bit about what its strengths are and where its innovations are, so forth.”

Yimnirun: “Let me briefly tell you that in Thailand, when we talk about ceramics, people tend to understand ceramics in the sense that it’s more to the traditional ceramics. Even though there are some industry in Thailand, they are technical ceramics and there’s some big company in Thailand.”

Vittayakorn: “In Thailand, we can classify the ceramic industry in two groups: the big company or like holding company, and small and medium-sized enterprise, or SME. For the big company, I’m not worried about their status because they are well organized and they have the technology knowledge and also they have manpower. They expand their business to, like, merge and acquisition, not only in Thailand but also Southeast Asia. For the SME, small and medium enterprise, some of them doing well in business but the others are not well organized. They lack knowledge and innovation, their product is easy to copy, and low productivity and high production costs. And, yeah, that is the point of view of ceramics industry in Thailand.”

Yimnirun: “Also, I think as Naratip mentioned, that is ceramic part and also, as we mentioned at the beginning, that the glass industry is also very important in Thailand. So maybe Jakrapong can also provide a little bit details on the glass industry in Thailand, so then we have a larger picture of the whole industry.”

Kaewkhao: “We have the two biggest company in Thailand. One is Bangkok Glass, Bangkok is the name of the capital city in Thailand, and second one is Ocean Glass. This is the two big companies in Thailand to produce the many glasses products and also, this is a big production. Let’s say biggest production in ASEAN, here in Thailand. So that’s why it is important, and it is big value of economy in Thailand from glass industry.

So, most of glass is still the conventional glass. I mean, how I can say, just traditional glass, not special one. Just bottle, just glass, just cullect glass, or just decoration. Okay, we have some more, like the window industry, just for the construction. This is also some innovation, but it’s merged with the thin film technologies, like smart windows, heat protection, or something like that. These are another part of the glass material in Thailand also that contribute in the market.”

Yimnirun: “I would also mention that Eileen asked about the innovation that these companies are trying to do. I think in the past 10 years or so, these big companies are trying to put in

some innovation so that they can make their value added to their products. Instead of just beautiful decorations, now there are some function that they're trying to put in. I think they are doing well on that part, and hopefully that we can contribute more to their innovation. But, as I mentioned, it's just started about 10 years ago. They are used to the conventional ceramic or conventional glass. Now, they need to make it more valuable, so they put in some function into that product. So that's what they're trying to do and they're investing a lot in the past five to 10 years."

De Guire: "Last fall you organized the Smart Material at 2020 [SMARTMART@2020], so that's a very interesting idea. Does that kind of pick up on your remarks about more functional materials?"

Yimnirun: "Yes, actually, this smart materials conference series started about 20 years ago, surprisingly. You know what, the people who actually got us started on this smart materials series were actually have Distinguished Life Member from ACerS. Of course, my late professor Robert Newnham, Eric Cross, and also there was professor Kenji Uchino and there was professor Amar Bhalla. These are the people who got us started in the smart materials because about 20 years ago they, of course when I came back to Thailand, they asked us, the same question you asked us, 'What is the landscape of the ceramic research in Thailand?' And at that time, nanotechnology just came across, you know, and then they said, 'Oh, maybe you should organize this meeting because it's the future of the ceramic research.' So that's why we organize this Smart Materials. And we got it going and then every four years we organize Smart Materials. The last time that we organized, just a couple months ago, was the fifth in the series. And it was very successful, and we believe that actually this smart material series got Thailand on the map in terms of the ceramic research, even though in Thailand we have been working on ceramics research for more than 30, 40 years. But this got us on the map, so very important."

De Guire: Okay. Sticking with the theme of industry, there was an announcement just earlier this week, just by chance, that the American company CoorsTek is breaking ground on a new facility in Rayong, Thailand. They expect to open this manufacturing facility in about a year, so in 2022, and they expect to ramp up to about 600 employees. So what do you think that says, what kind of message does that investment send to the Thai community working in the ceramics and glass industry?"

Yimnirun: "You know what, in the past five to 10 years, there's some declining in the interest in materials research, especially in ceramic research. We all started about 20 or 30 years ago. At that time, everything was going very good, you know, in terms of the number of people coming to the society, number of people, number of students coming to the program. Just last month, we understood that the situation is changing. We did a survey by this ACerS Thailand Chapter that we tried to understand the situation of the educational system in Thailand in, in particular in the ceramic science or materials science, is going. We got some information, very interesting information, I'll share it with you later. But this establishment of CoorsTek in Thailand would actually change the whole landscape. And, yeah, we were just discussing this evening that, 'Oh, maybe it's possible that we share this

news to potential students.' We believe that in the next five to 10 years, we will come back to actually get more attention from students and we believe that our ceramics society will actually come back and then get people to work for CoorsTek and it would be really great if we actually get to connect with them and try to understand them. That's one of the reasons why we establish this society, because we would like to be linkage between educational and government sector in Thailand with industry."

De Guire: "One thing I wonder, has your survey given you any insight as to why young people choose to study materials science and why they choose to study ceramic and glass materials in particular?"

Yimnirun: "At the moment, the data that I have, young people are interested in eco-friendly materials. They are looking forward more of the environmentally friendly materials. So that is something that, we would like to provide this information so that whenever any university in Thailand is going to make a new curriculum, they would understand, 'Okay, this is the area that you actually need to go instead of just open up any programs.' You need to be more specific and address the need of the young people.

Actually, the policy of the Thai government is gearing toward this bio-circular green economy. So a lot of things that we have discussed about. So, the young people are reading social media and they understand the terms more, I think they are more interested in this area."

De Guire: "Well, and all three of you have really picked up on that in your research in terms of Jakrapong and working with recycling of glass materials; and Naratip on energy harvesting using new materials, very efficient materials; and of course Rattikorn, smart materials are very highly functional, functionalized materials for specific kinds of applications. So, sounds like the Thai approach is already very aligned with how students are selecting their career paths. So, very exciting."

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CONCLUSION

De Guire: "While attending large international conferences is desirable, building strong local communities with like-minded colleagues is beneficial as well—and may help your region become the next go-to area for collaborations in the future.

I'm Eileen De Guire, and this is Ceramic Tech Chat."

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"Visit our website at ceramics.org for this episode's show notes and to learn more about the new Thailand Chapter and our other International Chapters. Ceramic Tech Chat is produced by Lisa McDonald and

Until next time, I’m Eileen De Guire, and thank you for joining us.”