Conference Call

Young Ambassadors for Chemistry (YAC) achievements in Mongolia

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YAC is a project that trains teachers around the world to communicate the benefits of chemistry to the general public with the help of their students as young ambassadors. A typical YAC event encompasses two to three days of teacher workshops, followed by a one-day, public event where students—the Young Ambassadors for Chemistry—share their enthusiasm and interest with the public at large, either in a public square or as part of a science festival. That last day of the YAC event is usually a festive time and fun for everyone involved. From 2004 to 2016, Lida Schoen and Mei-Hung Chiu organized 41 events, both small and large, in 29 different countries.

YAC in Mongolia

In September 2019, another YAC was held in Mongolia as an IUPAC Committee on Chemistry Education (CCE) project (2018-015-2-050) following CCE (Flying Chemistry Education Program) (see *Chem. Int.* Jan 2020, pp. 37-14). YAC in Mongolia was made possible by National University of Mongolia (NUM), especially vice president Ochirkhuyag Bayanjargal, professors D. Khasbaatar and C. Nyamgerel, the Ministry of Education, and Green Chemistry LLC. The YAC was three days long, and workshops for school teachers were held in the library of NUM on the first two days of the conference. On the third day, we had an open event for the public with students in Bluemon Center (a restaurant mall) near the university in Ulaanbaatar. Until the previous YAC, cosmetic chemistry had been used as main materials to illustrate how useful and important chemistry is in our daily lives. This time, we chose functional polymer instead because there are many kinds of functional polymers available around us which are safe and inexpensive, and some of them can be used in regular chemistry classes in high school. In addition, some polymers play important roles in the field of green chemistry, and we are expecting young students to be more interested in them.

Workshop for School Teachers (days 1 & 2)

The workshop for school teachers were composed of two parts. The first part featured lectures presented by project members of IUPAC and a polymer expert coming from Mongolian University of Life Sciences. In the beginning of day 1, Jan Apotheker explained IUPAC and Mei-Hung Chiu talked about the roles of YAC and how previous YACs have been carried out in many countries. After that, Masahiro Kamata made a lecture on relating school chemistry with our daily lives using simple examples. Later a polymer expert, Galaaraidi Otgondemberel, explained the basics of polymer and how they are used in our lives.

In the second part of the workshop, we introduced three experiments to the school teachers; 1) making slime using a polyvinyl alcohol (PVA) solution sold as laundry starch, 2) evaluating water absorption ability of the polymer taken out of a diaper, 3) science craft using UV resin. Although we did not use functional polymers in the first experiment, it is effective to make students recognize the phenomena of polymerization. Then, the teachers were asked to design and prepare the open event by arranging the experiments that had been introduced to them. The teachers were divided into four groups and each group was assigned to one experiment. The teachers discussed how to use what they had learned so far. They also prepared chemicals and apparatuses for the experiments as well as paper materials such as worksheet for the students.

Open Event (day 3)

Although we had planned to use a large shopping mall as a venue for the open event, the permission for the usage was suddenly canceled a few weeks before the event. Thanks to big efforts of Mongolian members, the YAC open event was allowed to be held in the gallery space next to the entrance of Bluemon Center. We set tables and chairs so that over 40 participants could be seated.

The event started at 10 a.m.; after the opening speech by D. Dorj (former rector of NUM), 57 high school students experienced three experiments using PVA, water absorption polymer and UV resin guided by teachers. After they got an idea of what a functional polymer was, the students discussed their dreams of future polymer in each group. What kind of polymer do they want? How and where do they want to use their dream polymer? Then the students presented their posters in front of the judges.

When the students finished their presentations, the students invited the public to their tables and let them do the experiments together. Before ending the morning session, awards for good presentations were given to three groups with some gifts from IUPAC.

In the afternoon session, elementary school students were invited and shown polymer experiments guided by high school students. This allowed the high school students to practice, demonstrate, and reflect upon their understanding of polymer experiments from the morning session and then act them out with the younger students.

After the experiments, every kid was asked to write their impression on the event on a post-it and orally presented it in front of all. Then the public (mainly the parents of the kids) were invited to the tables and enjoyed the experiments with high school students.

In the closing ceremony, a certificate of attendance

was sent to all high school students and elementary school students with small gifts sent from IUPAC. The event ended around 3 p.m. with a group photo of all participants.

Polymer experiments for the open event

The materials used in open event needed to be safe and inexpensive in addition to being explicit about the relation between chemistry and our daily lives. For those reasons, we chose functional polymer as a topic and the following three experiments using it.

As a first step the following demonstration is considered to be very useful. When borax is added to aqueous solution of PVA, molecules of PVA are bridged by borate ions and the viscosity of PVA solution is changed drastically. Therefore, this experiment is a good example for high school students to understand how cross-linking reaction works on the property of the material. In addition, students can easily recognize large amount of water can be trapped in a cage of polymer, which is closely related to a water absorption polymer. As for elementary school kids,

although they usually cannot fully comprehend the explanations, they can enjoy the property (viscosity) change by adding some chemicals. Something elusive is unusual for kids and most of them like to handle it with their bare hands.

Water absorption polymer (or superabsorbent polymer, SAP)

Water absorption polymer is one of the functional polymers that are used most widely in our daily lives as diapers. The materials itself is safe, inexpensive and easy to obtain almost everywhere (you can take it out of diapers). We planned to demonstrate 1) a large amount of water can be absorbed in small amount of SAP and 2) absorbed water cannot be released easily. In addition to simple experiment using measuring cups to demonstrate 1), a tiny glass bottle with a narrow neck and a colored SAP ball were prepared to show how much water a very small SAP ball (~1mm in diameter) can absorb. The SAP ball gets so large as 10mm in diameter as it absorbs water. Therefore, those who have not seen the initial state cannot imagine how the ball got in a bottle through a narrow neck, which enhance observers' interest in the function of SAP.

UV resin

UV resin is also one of the functional polymers that are used for many purposes; such as dental treatment, nail art, and so on. In the demonstration, students made a rubber stamp by placing a printed mask over the resin and irradiating it with UV. Through this experiment, they can easily recognize only the part of the resin that are irradiated by UV is solidified. As for elementary school kids, a much more simple activity to make a "YAC badge" was devised by Mongolian school teachers.

Communication to the public

During the open event on day 3, there was a chance for the public to enjoy the experiment with high school students both in the morning and afternoon sessions. Since this session was less than 15 minutes and the number of the people who can participate it was limited, we prepared a leaflet which illustrates our activities and distributed them with a questionnaire to the people who visited the venue. In the leaflet, we explained briefly the demonstrations presented in the open event. We also explained what IUPAC and YAC are.

During the open event, we were interviewed for internet TV in Ulaanbaatar, and our activities were introduced via facebook and twitter by the tovch.mn social media agency.

Dream polymers presented by high school students

A lot of unique and creative ideas were presented by high school students. Some of them are listed below:

Shine Mongol school

Using polymer in a 3D printer to make a miniature model of a building or machine. A polymer that can be combined with inert gas and made light.

The polymer can be used as vegetable soils by absorbing water and minerals. Water absorption polymer can be used to remove rainwater, and to prevent flooding by making a dam. Polymers that are easily hardened can be used for plaster and bandage at the hospital. Polymers are easy to change, so they can be used as a tool (robot) to reach a place where the person cannot reach.

School No 33

Polymers that emit heat, light and transmit electricity are the solution to energy issues and greenhouse gases in human life. If in the future combustion and heat resistant polymers are available, they may be used for building insulation and fuel. In the future, if there are light-transmitting polymer compounds, they may be used instead of glass. My dream polymers are very light and as hard as metal. I believe it will be widely used in road and bridge construction.

Baigal Ekh, affiliated school of NUM

Smoke absorbing polymer, make building material by polymer, to reduce pollution using polymer, increase polymer household use, such as the use of polymer filters.

School No 11

We want to have a super absorbent polymer. Absorbing the environmental pollution and releasing only the water will make an ecologically clean water cycle.

However, the polymer that absorbed the other contaminants can be processed into fertilizers.

Feedback from the participants

Three kinds of questionnaires were prepared for teachers, high school students and ordinary people, respectively. 37 high school students responded and most of them answered "After this activity, I acquired more about the application of chemistry in our daily life," and "After this activity, my image of chemistry gets positive." They also showed strong interest in the experiment and most of them answered that they would like to participate again if similar activities are organized. 13 school teachers responded and most of them answered "I think I learned much from this activity" and "I am satisfied with the content of teaching materials of this activity." All of them answered that they would like to participate again if similar activities are organized. As for the ordinary public, 18 results were collected. Although eight of them provided rather negative answer regarding the question "How much do you think you know about chemistry?", twelve of them answered they had positive impression after the event. Most answered that they liked what the students are doing.

Twenty elementary school kids (most of them in 5th grade) participated in the event and we asked them to write down their impressions as mentioned above. All of their answers were positive and some of them are listed below:

- *I liked it very much. We have done many beautiful experiments and we made stamp. Thank you for making these beautiful experiments.*
- *My school did not do such experiments. I am very excited today.*
- *I understand what chemistry is from this experiment. I did not know what chemistry was first. I knew that we use chemistry every day.*

The impact on the high school students and the school teachers was much larger than expected. In addition, we got positive feedback from university professors and chemistry company who were involved in this event. Therefore, it is highly expected that the benefits of chemistry will be informed to the public in the future via students (young ambassadors) and teachers, and that this kind of activity will be continued in Mongolia.

Acknowledgements

We would like to take this opportunity to thank IUPAC CCE for providing the grant for the YAC event to be held in Mongolia. We would also like to express our sincere thankfulness to National University of Mongolia for their full support in many ways to make the event possible, in particular, special thanks to vice president Ochirkhuyag Bayanjargal, Professors D. Khasbaatar and C. Nyamgerel, Ministry of Education, and Green Chemistry LLC for their kind support. At last, two graduate students, (Mina Tsuchiya, and Taiga Inamura) were very helpful to conduct the experiments and to facilitate teachers' and students' activities.

21st Mendeleev Congress on General and Applied Chemistry*

by Nikolay E. Nifantiev

The 21st Mendeleev Congress on General and Applied Chemistry was held on 9–13 September 2019 in Saint Petersburg under the auspices of IUPAC. Mendeleev Congresses are the main Russian chemical forums which, typically, take place every 4 or 5 years, and usually proceed in major regional centers of the country. Saint Petersburg is one of the biggest industrial, cultural and scientific centers of Russia with renowned universities, academic research institutes and industrial corporations, including giant metallurgical plants.

The first Mendeleev Congress was held in Saint Petersburg in 1907 in memory of the prominent Russian chemist D. I. Mendeleev (1834–1907). Further Congresses

were held in a number of famous scientific centers all over the former USSR: in Moscow, Volgograd, Leningrad (now Saint Petersburg), Kazan, Kharkov, Kiev, Alma-Ata, Baku, Tashkent, and Minsk. The 19th Mendeleev Congress (Volgograd, 2016) was associated with the International Year of Chemistry, while the jubilee 20th Congress (Ekaterinburg, 2016) was dedicated to “New horizons of chemistry in the 21st century.” The 21st Mendeleev Congress was associated with worldwide celebration of the 150th anniversary of Dmitry Mendeleev's discovery of the Periodical Table. It was proclaimed by the United Nations General Assembly in December 2017 as the “International Year of the Periodic Table of Chemical Elements” (IYPT 2019) following the initiative by the Russian Federation supported by IUPAC, the International Union of Pure and Applied Physics (IUPAP), the European Association of Chemical and Molecular Sciences (EUCHEMS), the International Council for Science (ICS), the International Astronomical Union (IAU) and the International Union of History and Philosophy of Science and Technology (IUHPS) and of numerous scientific organizations from more than 80 countries.

Led by UNESCO, IYPT 2019 brought together hundreds of national and international partners to raise awareness of the importance of chemistry and periodicity in areas such as sustainable development, health, food, water, energy, education, climate change and biodiversity. All the above listed critical topics were discussed during the 21st Mendeleev Congress which traditionally welcomed scientists from all over the world and provided the highest level of scientific discussion on contemporary problems in various areas of modern chemistry. It also provided a wide range of participants (students, graduate students, teachers, researchers from different countries) a possibility to get in touch with the world advanced scientific achievements in the field of chemistry including its fundamental aspects and industrial achievements. That is why Mendeleev Congresses are recognized as the largest Russian scientific events focusing on most priority directions of chemical research. They traditionally maintain interdisciplinary programs that highlight new research prospects, as well as advances in chemical industry and professional education. In addition to the scientific discussions, Mendeleev Congresses feature the networking links between business, industry, and academy.

The 21st Mendeleev Congress was co-chaired by the President of the Russian Academy of Sciences, Academician Alexander M. Sergeev; Russian Minister of Science and Education Mr. Mikhail M. Kotukov; and Vice-governor of Saint Petersburg Mr. Vladimir V. Kirillov, while the