

# Poly Village

PolyMirae Magazine  
2019 New year Vol.42



# Moplen EP140R

Enhance the impact of polypropylene at low temperature



*Moplen* EP140R overcomes the conventional limitations of polypropylene. This grade is primarily used in polyolefin based compound to provide enhanced performance and cost savings at the same time with reduction of the total amount of impact modifier used in the recipe.

>>> *Moplen* EP140R



# Poly Village

2019 New year Vol.42

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## Dear Business Partners, dear Employees,

I would like to extend first of all my warm wishes to you and to your families for the New Years.

As we start the New Year, I would like to thank all of you, for your loyalty and support.

It has been another very challenging year in all industries.

PolyMirae has first of all recorded another safety record, we reached in fact in September a period of 6 years without a recordable accident.

This is a very significant achievement and we all shall be proud of this.

We are looking forward, also in this new-year, to maintaining our workplace and our behaviors safe.

On the market side, we have continued to work to build the future of our company.

We have successfully established a JV, named Ulsan PP Company ("UPP"), in partnership with SK Advanced, to build a new PP plant.

The new plant will have a production capacity of 400 KTA and will use the latest generation *Spheripol* technology.

We expect to be able to start-up the new line in the 1H2021.

This additional volume will allow us to support our expansion strategy and to continue to serve our customers globally.

Our customers, our suppliers and our service providers share with us the same ambitions for a profitable growth in the future.

We have been also investing in new resources and new staff, we have been selecting and recruiting new young talents for our teams, both in Seoul and in Yeosu. This is also very important to build our future.

Our vision is indeed to continue to be the most admired company in our industry in Asia.

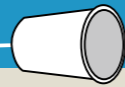
I wish you and your family's health, happiness and success in the New Year.

January, 2019

PolyMirae Company Ltd.  
President and CEO  
Martino Gabellich



# For Healthy Communication in PolyMirae

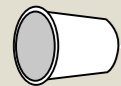


**BH Kim,**  
Executive Director / Sales and Marketing

It seems that in recent years, the most significant political and social topic has been 'communication'. And it is ironic to see that while the media of communication such as the social media greatly developed over the years, close personal relationship is becoming rather more disconnected and the feeling of solidarity is weakening day by day. It might be quite natural for the mankind to be more concerned about true communication amidst the tide of changes.

Communication is also one of the biggest matter of interest in a company. This is because a healthy communication mechanism must exist for a company to obtain eye-opening achievements and become socially reputable. Healthy communication facilitates sharing of information and knowledge among employees, improves collective creativity, and creation of organizational culture with mutual trust.

PolyMirae is also greatly interested in not only how smoothly the members of the organization are communicating, but also whether they can tear down various walls of disunity of the organization and individuals through thoughtful communication and facilitate creative innovation through mutual sympathy and cooperation, creating the culture for continued growth of the company.



## For Healthy Intra-company Communication

To promote healthy communication in the organization, the method and channel of communication which suits the characteristics of the company should first be considered. The means and channels of communication which can easily be accepted by the employees should be selected based on organizational culture, and efforts to frequently review the appropriateness of those should be combined. Also, it should be noted that the efforts may be ineffective regardless of how developed or outstanding the tools of communication are, if employees do not embrace appropriate attitude and habit for communication. In particular, leaders of organizations should not only focus on improving his/her communication skills, but also establish unique philosophies and principles of communication.

Under the slogan of 1WT (1 Winning Team), PolyMirae upholds our unique culture of communication as specified below.

- **1WT is not based on forced sympathy in which individualism is unencouraged, and allows free expression of opposite views and personal opinions even if they are different to those of others**
- **While the spirit of 1WT is founded on the principles of organizational management, it does not agree with top-down hierarchical commands. Everyone is the leader in a true 1WT.**
- **The hardship of a colleague is not a chance for someone to stand out, but something that should be born or overcome together.**
- **1WT shares the same conviction through clear and inspiring visions and missions of business, and the joy of working together with colleagues. We share a common corporate culture.**

Based on understanding and solicitude, every member of our company has sought openness to new challenges and changes through inter-departmental information exchange and cooperation. Everyone also sought to not only communicate smoothly on business, but facilitate communication based on emotion which enhances the quality of intra-organizational relationship founded on mutual understanding and solicitude between the superior and the subordinate, and emotional exchange and sympathy between departments or colleagues. I believe that such organizational culture originates from the leaders' mindset of recognizing the individual members as true colleagues and partners, rather than as subordinates.

In sales or marketing organizations, it is quite normal for the manager and staff to communicate free-heartedly on the task. Processing various tasks from the initial stages of sales and production planning to inventory management and shipping through communication without any constraint will allow amicable settlement of any problems which may occur. When witnessing one's respectful attitude toward the opinions of all staffs concerned without being biased or weighted, I again realize the importance of communication based on solicitude.

Our company consists of small groups compared to large enterprises, and this may act as a great benefit in establishing a good communication culture. This is because effective communication channel can be optimized relatively easily, allowing swift decision-making based on mutual respect and trust, rather than in a top-down way. PolyMirae's method of communication which cooperate to solve problems as true partners and colleagues under the spirit of 1WT is a strong virtue and source of pride of the company. Lastly, I wish to introduce three slogans which best represent the organizational culture of our company which is full of energy through communication. These slogans are the prize-winners of the 1WT Slogan Contest hosted at the 2015 Company Workshop.

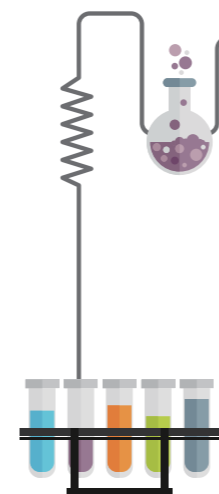
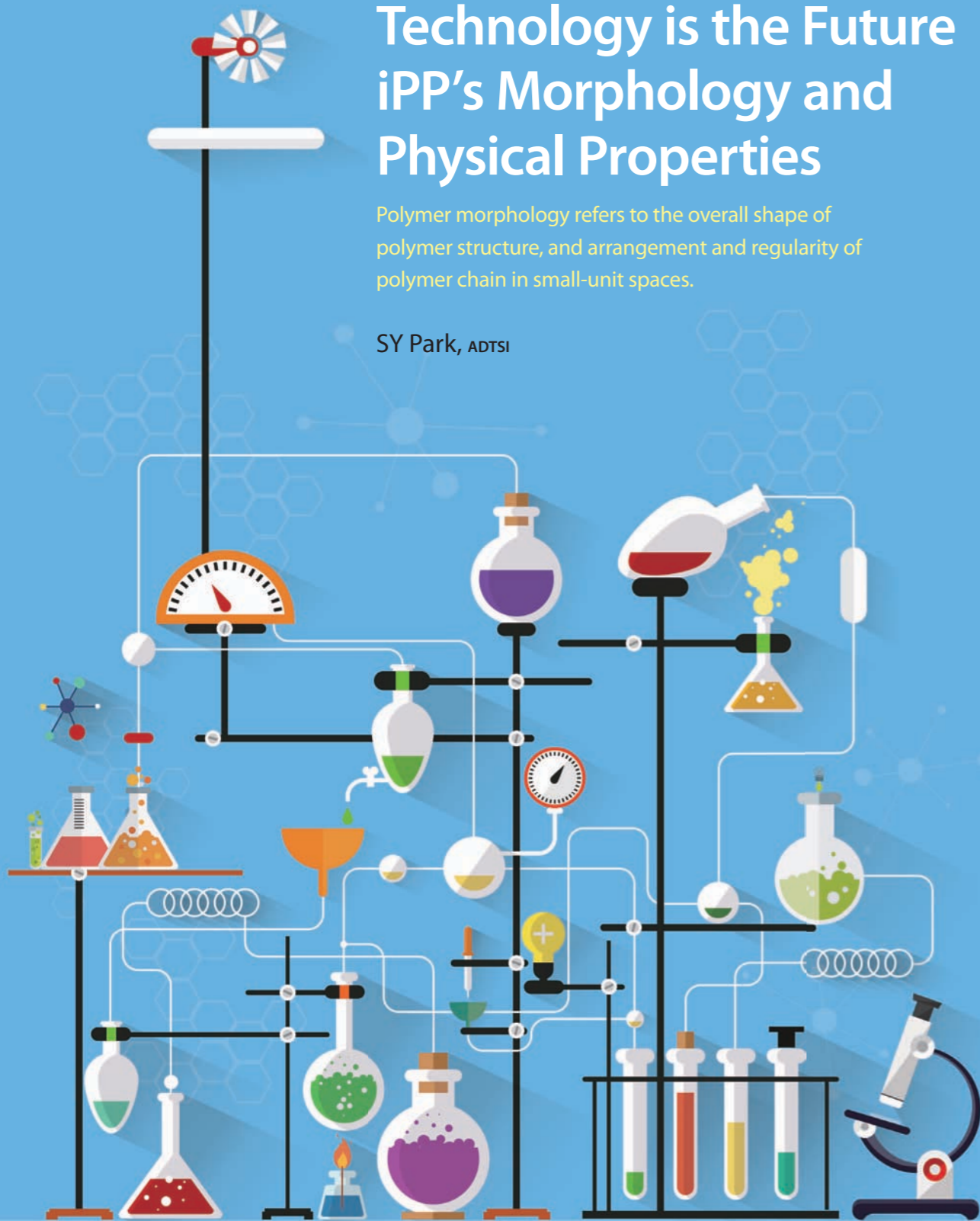
- **People Who Cheer Each Other Up by Working Joyfully as If Playing a Game**
- **Faster than Others, Different to Others**
- **My Team Changes Based on My Actions**



# Technology is the Future iPP's Morphology and Physical Properties

Polymer morphology refers to the overall shape of polymer structure, and arrangement and regularity of polymer chain in small-unit spaces.

SY Park, ADTSI



## Brief History of iPP

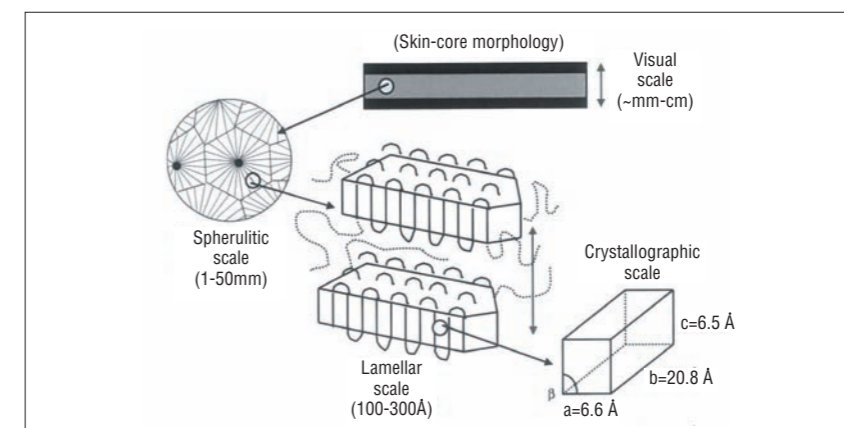
Polypropylene's properties vary based on its chemical structure and shape of the crystal, and the crystal inside the polymer is a greatly influential factor in determining the property. In early 1950s, scientists could synthesize oily or waxy low molecular amorphous Polypropylene (aPP), but they were never commercially produced due to the lack in merits in terms of mechanical property, as long, uninterrupted and stereo-regular polymer chains to form the crystal was difficult to make using the existing method of radical polymerization.

Giulio Natta, an Italian chemist, overcame this limitation. In 1954, with Montecatini, Natta successfully composed crystalline isotactic Polypropylene (iPP) by conducting coordination polymerization on Propylene using Ziegler-Natta (ZN) catalyst. With the degree of crystallinity in the range of 40 ~ 70%, iPP showed commercially valuable level of stiffness, leading to rapid increase in production, and the properties of the iPP is continuously being complemented and the demand is increasing even to this day. Giulio Natta was awarded the Nobel Chemistry Prize in 1963 with Karl Ziegler for their contribution to the synthesis of iPP.

## Brief History of iPP

Extensive research on the properties of iPP polymerized with ZN catalyst took place to discover the application of iPP in various fields. The properties of iPP stem from the unique morphology and processing history of iPP. Let us first observe from the context of morphology.

Polypropylene Homopolymer (Homo PP), which is polymerized solely by Propylene, is a semi-crystalline substance. The reason why the substance was categorized as semi-crystalline is because both crystals and non-crystals. As are many semi-crystalline polymers, Homo PP show the following details of structure as seen in Figure 1.



< Figure 1 > Skin-Core Morphology of Injection Molding Specimen

Let's observe the structure of injection molded material produced through Homo PP from a smaller scale to a larger scale.

(Crystallographic scale → Lamellar scale → Spherulite scale → Visual scale)

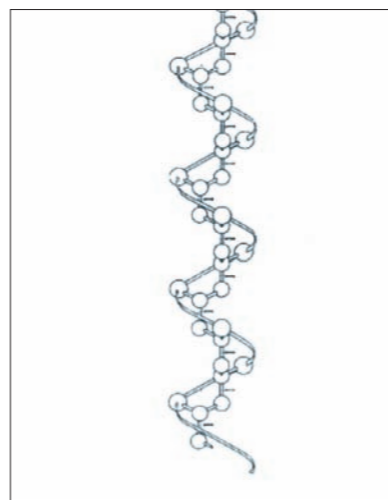
Polypropylene chain resembles the shape of a helix as shown in Figure 2 due to the steric hinderance of methyl group, and the structure and spatial arrangement of the helix may vary in the crystallographic scale of 0.6~2.0nm. Crystals formed in the scale can be categorized as alpha ( $\alpha$ ), beta ( $\beta$ ) and gamma ( $\gamma$ ), and the

majority of the Homo PP commercially produced has  $\alpha$ -form crystal shape. Thus, the characteristics of the crystal conform to the characteristics of  $\alpha$ -form iPP, which is the most stable among the three forms of  $\alpha$ ,  $\beta$ , and  $\gamma$ .

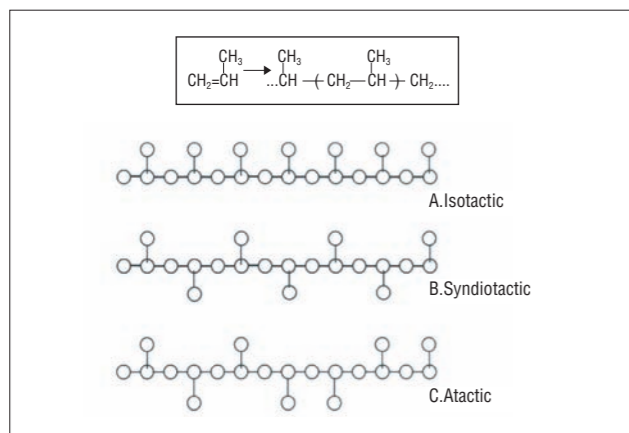
Lamella is a 5~20nm-thick thin plate-shaped crystal which consist of polymer chains folded in a certain pattern. Lamellae are regularly stacked 10~30nm apart to constitute a part of Spherulite, ultimately creating a globular crystal 1~50 $\mu$ m in size. (For reference, the average thickness of human hair is 80 $\mu$ m.)

### Crystal of Homo PP

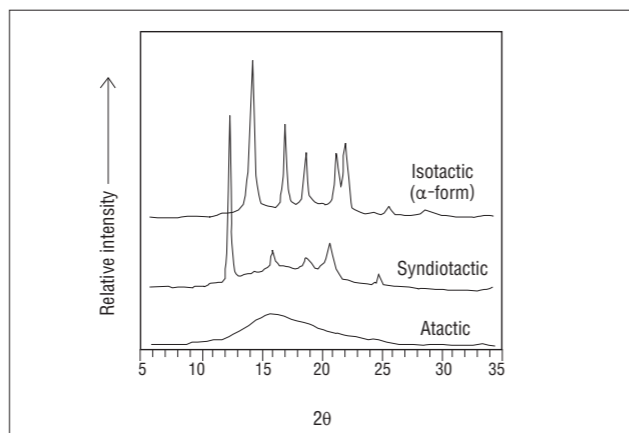
The crystallinity of Homo PP is influenced the most by the stereoregularity of the polymer chain as shown in Figure 1. If methyl groups are aligned to one side as in polymer chain A of Figure 3, the PP is isotactic, and if one methyl group is aligned to the opposite side of the neighboring methyl group as in polymer chain B, the PP is syndiotactic. If there exists no regularity in the alignment of methyl groups as in polymer chain C of Figure 3, the PP is atactic. The majority of commercially produced PP has isotactic polymer chains as in A of Figure 3, and PP with isotactic chains are generally called iPP. Whether the chain is isotactic, syndiotactic or atactic can easily be determined through Wide-angle X-ray analysis. Strong patterns from crystal unit cells can be found on isotactic PP and syndiotactic PP, while very wide and dispersed unique noncrystalline patterns can be found on atactic PP (see Graph 1). Nowadays, it is possible to produce iPP which the isotactic index is increased to 99% using catalyst technology.



<Figure 2> Helix Structure of Crystalline iPP Polymer Chain



<Figure 3> Conceptual Diagram of iPP, sPP, and aPP Polymer Chain Based on Stereoregularity



<Graph 1> Typical Wide-angle X-ray Scattering Patterns of iPP, sPP, and aPP

### Crystal and Properties

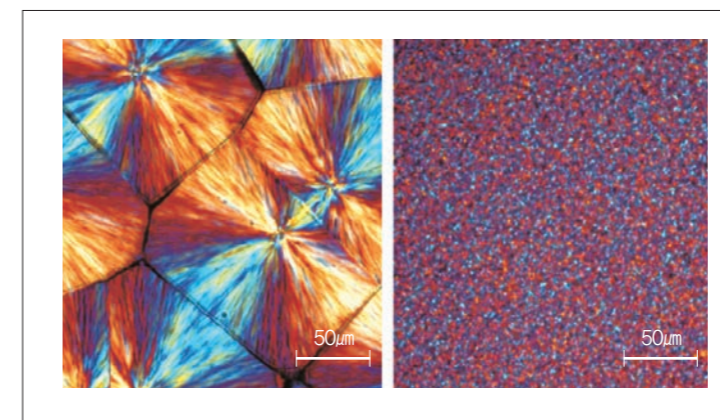
Mechanical properties, thermal nature, characteristics of exterior, and optical characteristics of Homo PP differ based on the defect, size, shape, and percentage of amorphous phase of the crystal.

### Defects of Crystal

The defects of Homo PP usually emerge where errors in stereo-regularity, which was explained earlier, and regio-regularity, which is related to the shape of connection of Propylene monomers, exist. The melting temperature of  $\alpha$ -form iPP is greatly influenced by intra-chain defects or inter-chain defects. The less the number of defects, the easier it is for polymer chains to form crystals, showing trends of higher melting point. In contrast, the PP obtains elastomeric property, or in general terms, softness, as the degree of distribution of intra- and inter-chain defects increase. Therefore, defects of crystals can act as factors in upgrading the properties of the PP depending on how they are used.

### Size-Shape of Crystal

The bigger the size of the spherulite, the worse the scattering of light and the transparency of the product. To reduce the size of spherulite and improve its transparency, 1) external substances should be added to increase the number of crystalline nuclei, or 2) expedite the cooling process (quenching). Method 1) can be done by using transparent nucleating agent as additive, while method 2) can be done by reducing the cooling temperature during manufacturing. The left-hand side of Figure 4 is a polarized microscope image of spherulite, while the right-hand side is an image of the same iPP after nucleating agent was prescribed. It can be found from the two images that the size of the crystal decreased significantly after the nucleating agent was used. Similar to this, the size of crystals can be controlled by making changes to manufacturing conditions. For instance, when manufacturing cast film, lowering the chill roll temperature will reduce the



<Figure 4> Polarized microscope images of iPP Spherulites (left) isothermally crystallized in 130°C without nucleating agent, (right) with nucleating agent

size of crystals and improve transparency of the product. While there exist transparent nucleating agents used to improve the transparency of the product, there also exist other types of nucleating agents focused on improving properties such as stiffness or heat deflection temperature (HDT). While prescription of all nucleating agents leads to the reduction of the size of crystals, different properties are enhanced based on the status of formed crystals, and thus nucleating agents are selected based on the applications of the products.

### Conclusion

Homo PP's crystal is greatly influenced in stereo- and regio-regularity, the distribution of intra- and inter-chain defects, additive prescription, and process history. In order to synthesize and upgrade the quality of the polymer with ideal crystal for the application, high level of catalyst technology, process technology and optimized additives are required. PolyMirae proactively adopts latest catalysts, processes and additives to fulfill client demands and strengthen product competitiveness.



# PolyMirae Manufacturing Director KY Yoon Awarded Government Industrial Service Medal at the Korea Gas Safety Awards

Executive Director KY Yoon was awarded the Government Industrial Service Medal at the 25<sup>th</sup> Korea Gas Safety Awards which took place on July 6<sup>th</sup>, 2018 at 63 Building, Yeouido. Industrial Service Medal is awarded to those who have contributed to industrial development and growth, or rendered outstanding meritorious services by applying himself/herself to his/her business, or to an employee working in a factory, place of business or other place of employment who has rendered outstanding meritorious services in the interest of national development by applying himself/herself to his/her duties.



PMC Employees and KY Yoon (KB Chun, KY Yoon, JY Lim from left side)



KY Yoon (PMC Manufacturing Director, Left) and HG Kim (President and CEO of Korea Gas Safety Corporation, Right)



Industrial Service Medal Awarded to Plant Manager KY Yoon

The award is an acknowledgement of the contributions of all employees working at the PolyMirae Yeosu Plant under the direction of KY Yoon, in managing investment and safety activities to prevent gas accidents, in particular preventing gas accidents through qualitative risk assessment on gas facilities and establishment of related measures.

Major actions taken by PolyMirae Yeosu Plant to prevent gas safety hazards are as follows.

▶ **Prevented accidents through innovative qualitative risk assessment on gas facilities and establishment of countermeasures**

- Conducted qualitative risk assessment with BakerRisk, the largest overseas risk assessment company and LyondellBasell, our shareholder company, established follow-up measures through ALARP (As Low as Reasonably Practicable) Study and implemented activities to prevent fire or explosion accidents
- Conducted reinforcement (Installation of new fresh air intake facility, reinforced blast door, collapse prevention, etc.) on Emergency Shelter (Control Room), demolished pilot plant, and installed additional firefighting equipment on risk points throughout the process

▶ **Adopted world-class safety environment and health process design standards**

- After foundation, PolyMirae adopted advanced process design standards of LyondellBasell (LYB), our shareholder company, to apply them in the establishment, expansion or change management of plants, and implements preemptive measures to issues which require improvement discovered through LYB's periodic inspection. Also, based on such actions, PolyMirae continuously strengthens investment in safety facilities and site improvement activities to prevent gas fire-explosion accidents.

▶ **Developed own Operational Excellence Management System by benchmarking advanced systems**

- In 2011, PolyMirae has benchmarked LYB's advanced OEMS (Operational Excellence Management System) for more than a year to develop and adopt a new innovative system named POEMS (PolyMirae Operational Excellence Management System) which comprehensively manages related domestic regulations and SMS requirements. POEMS is being benchmarked by other enterprises.

▶ **Developed IT-based HSE Management System on all SMS items**

- Computerization is being conducted on existing SMS items which had to be handwritten and thus lacked efficiency and practicality, and the new system is to be launched by the end of 2018.
- To not adopt a standardized system but to establish a new system specialized for PolyMirae, designs of key SMS items including process safety data management, change management, subcontractor management and process facility inspection management was completed by a professional agency.

▶ **Safety Environment and Health Committee operated by shareholders and board of directors**

- In March 2016, LYB and Daelim Industrial Company, our shareholder companies, newly founded the Safety Environment and Health Committee to review safety environment and health-related issues and approve investments required for improvement. 6 meetings have been convened up to now, for which PolyMirae had prepared for and reported various safety environment issues and countermeasures.

▶ **Developed and Implemented innovative programs for the improvement of safety culture**

- Annual Global Safety Day  
All workplaces of LYB including those of its joint ventures designate and host the annual Global Safety Day. PolyMirae also conducts company-wide crisis response training, various safety trainings, safety facility information sessions and safety contests to promote safety consciousness throughout the company.
- "World's Cleanest Workplace" Campaign  
Acknowledging that unsafe work environment is the fundamental cause of all safety accidents, all employees of PolyMirae Yeosu Plant participated in the "World's Cleanest Workplace" campaign since 2016. The performances of various events hosted are reported, based on which rewards are awarded.



Martino Gabellich CEO of PolyMirae and CJ Kim CEO of SK Advanced (from left side)

## PolyMirae and SK Advanced Sign 400Kt PP Plant Joint Venture Agreement

On June 22<sup>nd</sup>, 2018, PolyMirae and SK Advanced signed a joint investment contract on 400Kt-size Polypropylene plant at PolyMirae headquarters. CEO Martino Gabellich of PolyMirae and CEO CJ Kim of SK Advanced attended the signing ceremony, joining the attendees from Daelim Industrial Company, LyondellBasell and SK Gas, the shareholder companies of the two contracting parties. "Through the joint investment, SK Advanced's reliable and competitive raw material supply and PolyMirae's differentiated PP product portfolio and marketing capabilities will create significant value" said CEO Gabellich at the signing ceremony, "and PolyMirae will be able to expand its customer base in the automotive, packaging and non-wovens industries" Also, CEO CJ Kim of SK Advanced commented "PolyMirae is a company well-recognized in the market for its long standing history of PP production and sales, and high added value products", and "thanks the completion of value chain integration from Propane and Propylene to Polypropylene through the foundation of the joint venture, SK Advanced has successfully secured a reliable demand for Propylene, through which the company expects as well to reinforce the competitiveness of the gas and chemical business promoted by SK Gas, our parent company."

KB Chun, HR-ER



Manufacturing Director KY Yoon was Awarded Industrial Service Certificate and Medal

## Manufacturing Director KY Yoon Awarded Government Industrial Service Medal at the 25<sup>th</sup> Korea Gas Safety Awards

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The award is an acknowledgement of the contributions of all employees of PolyMirae Yeosu Plant under the direction of KY Yoon in continuing various facility investment and safety activities to prevent gas accidents, in particular preventing gas accidents through qualitative risk assessment on gas facilities and establishment of related measures. See Field Sketch on Page 12 for details.

JY Lim, HSE



PolyMirae's Noninjury Record Panel, Showing that the Company has Reached 2,400 Days of Noninjury Record

## PolyMirae Achieves 2,400 Days (8 Times the Standard Noninjury Man-hours) of Non-injury Record

As of 24:00, October 30<sup>th</sup>, 2018, PolyMirae achieved a meaningful record of 2,400 days without accidents. The record is even more significant considering that the Debottlenecking project of Pyeongyeo Plant and the Yecheon Plant overhaul took both place in 2018, in September and October, respectively. The outstanding achievement was made possible thanks to the entire staff of PolyMirae who contributed to the implementation of the company's safety environment policies of 'Safety Perfection without Exception!' and 'The cleanest site in the world!' PolyMirae was able to achieve outstanding performance by upholding safety as the primary value, and all executives and staffs place safety as the top priority and principle of action. Everyone should maintain such mature and open safety culture and continue making efforts to achieve 100% noninjury record.

JY Lim, HSE



Staff joining the Safety Rally prior to the Overhaul

## Production 1 Team Successfully Completes Regular Statutory Turnaround

Regular overhaul of Production 1 Team, which began with Safety Meeting and Rally, successfully ended based on active cooperation of executives, staffs and subcontractors.

This overhaul is meaningful in the sense that much work was done in an efficient manner while maintaining max 52 hours/week of standard working hour, and that the company was able to make a new leap for the development of PolyMirae's safety environment. Various improvements including the installation of automatic water discharge firefighting monitor, earthquake-resistant design, active investment in improving safety environment in reflection of flare load, effective investment to increase production and reduce staff workload, and replacement of aged facilities took place during the overhaul.

Manager SR Cho of Production 1 Team effectively conducted the overhaul by filing a detailed work plan (detailed plan including workforce assignment for each task, subcontractors in charge, type of work to be done, task supervisor



and superintendent) prior to the overhaul, and led the team to engage in the overhaul in a practical and effective manner by reviewing construction plans, safety and health control plans and risk assessment reports with the subcontractors on all works.

Also, Safety HSE Team engaged in every stage of the preparation of the overhaul from investment phase to change management, on-site briefing for subcontractor selection, and subcontractor construction plan and risk assessment review, to provide advice on legal compliance and investments. Above this, the efforts of the management who upheld safety as the primary value and actively supported investments, executives and staffs who dedicated focus to achieving noninjury, and subcontractors who diligently cooperated throughout the overhaul, played all a terrific role for a safe completion of the overhaul.

TS Kim, HSE

### BAP - PMC Marketing Meeting

PolyMirae sales and marketing staff attended the quarterly BAP Marketing Meeting hosted at LYB Hong Kong Office on June 26<sup>th</sup> and at PolyMirae Korea Head office on October 11<sup>th</sup>. BAP Marketing Meeting is a quarterly meeting organized with BAP (Basell Asia Pacific), the sales channel in charge of PolyMirae products' export to China, Northeast and Southeast Asia. All related departments including Sales, Marketing and ADTSI Team gather at the meeting to discuss all commercial and technical pending issues. Also export regional supply/demand and market trends, and associated demand forecasts were discussed. A specific focus was given during the meeting also to the promotion of PMC newly developed products.

PolyMirae and BAP engaged in in-depth discussion on the ongoing "Task Force" projects for specialty products and for the development of new markets. Agreed together strategy and plans to further expand market penetration for impact copolymers and as well how to further increase export to the Japanese market.

In particular, beginning this quarter, a separate meeting of marketing managers was hosted before the Marketing Meeting for concrete and in-depth discussion on business issues, resulting in successful definition of more detailed plans.

SH Jung, Sales-Market Development



PMC and BAP Staff discussing market development plans



TS Kim, presenting the Best Practice Case Study on Safety Technology Improvement

### PolyMirae Staff Visit Turkish and European Clients

Executive Director BH Kim and staff of the Market Development Team visited Turkish and European clients for 12 days from July 1<sup>st</sup> to 13<sup>th</sup>.

In Turkey where it was difficult in the past to achieve continued sales due to a fierce competition in the market, PolyMirae met again with the support of the BIT channel all large Melt-blown client enterprises, to introduce the quality excellence of our products and commit to stable supply. The visit has generated interest and at a later stage, in the second half of 2018, also a very successful business expansion.

PolyMirae staff also attended meetings with automotive compounders and official LYB local distributors to introduce our differentiated portfolio and discuss future business expansion opportunities.

Later on, the staff visited major European *Metocene* and compounding clients, with BSM support, focusing on strengthening relations, and also the European headquarters of Asian clients for potential new Melt-blown business opportunities, raising interest for successful trade through in-depth discussion with global purchasing officers

SH Jung, Sales-Market Development

### PolyMirae Presents Best Practice Cases at Korea Gas Safety Corporation's Safety Technology Improvement Workshop

The 38<sup>th</sup> Petrochemical Plant Safety Technology Improvement Workshop and Technology Seminar, hosted by Korea Gas Safety Corporation, took place on November 29<sup>th</sup> (Thu), 2018 in Jecheon, Chungcheongbuk-do Province. At the Workshop, PolyMirae presented its best practice case under the title of 'Sharing the Results of FSS & QRA'. For the last five years, PolyMirae conducted FSS (Facility Siting Study) and QRA (Qualitative Risk Analysis) activities with LYB, the parent company, and BakerRisk, a U.S. risk assessment company, and after reviewing the results of reductive measures taken based on the activities, Korea Gas Safety Corporation was very satisfied and requested PolyMirae to share the best practice. The activities include the assessment of risks posed by fixed or transportable structures in cases of diffusion, fire or explosion due to gas leak, and implementation of reductive measures through ALARP (As Low as Reasonably Practicable) study. Attendees of many other companies paid close attention to PolyMirae's presentation and asked several questions. PolyMirae will continue its efforts to present best practices in the Industrial Complex by actively engaging in safety environment activities.

TS Kim, HSE

### Special Fire Safety Inspection from Yeosu Fire Station

From October 22<sup>nd</sup> to 23<sup>rd</sup>, 2018, Yeosu Fire Station conducted Special Fire Safety Inspection on three workplaces of PolyMirae Yeosu Plant. Special Fire Safety Inspection is the inspection on fire safety management, conducted in order to verify whether fire-fighting systems or such are installed, maintained, and managed in compliance with this Act or other statutes that are related with firefighting, and whether any risk of fire, disaster, calamity, etc. exists in fire-fighting objects.

A team of inspectors from Yeosu Fire Station, consisting of the Manager of Industrial Safety Team, Chief of Industrial Safety Squad, and fire captain, visited the plant and inspected whether all legal requirements on all hazardous substances, handling facilities and safety & firefighting facilities are complied, and that all hazardous materials and firefighting facilities are maintained appropriately to not cause any inconvenience in the operation of the plant. Yecheon Plant was inspected on the first day of the inspection. While there were concerns about the special inspection, as Yecheon Plant was under overhaul and many workers were engaged in dangerous tasks, the inspection ended successfully thanks to the dedication of the Manager and the staffs of Production 1 Team who devoted lots of time for the precheck. Yongseong and Pyeongyeo Plants also passed the Special Fire Safety Inspection without being fined for negligence, thanks to the active cooperation of managers and staffs.

At this moment, I would like to share words of gratitude to the members of Production Team and Special Fire Safety Inspectors for their full material and spiritual cooperation.

KB Park, HSE

### PolyMirae Pyeongyeo Plant Conducts Joint Fire Drill

On October 17<sup>th</sup>, Hanwha Chemical Plant 2, Lotte Advanced Materials, PolyMirae Pyeongyeo Plant and Yeosu Fire Station gathered and conducted Joint Fire Drill. The training which took place at PolyMirae Pyeongyeo Plant began without any notice on the date, time and message, to prepare for abrupt actual emergencies. The Director of Prevention and Safety Department of Yeosu Fire Station positively rated the joint drill, stating that the drill successfully ended without any problems.

KB Park, HSE



The PMC participants in the First Aid Contest

### Yeosu City Conducts Soil Contamination Measurement

Yeosu City conducts measurement of soil contamination level on key areas in Yeosu Industrial Complex which are feared to suffer from soil contamination, in accordance with Article 5 of Soil Environment Conservation Act. PolyMirae was selected as the subject this year, in particular the D1902 oil tank at Yecheon Plant and Waste Oil Storage of Pyeongyeo Plant.

The measurement was conducted by a Team Manager of Yeosu City Office and the staffs of the measurement company, and the results revealed that PolyMirae's workplaces are free from any issues regarding soil contamination. All staffs at PolyMirae should pay continued interest in the environment, not only to comply with the reinforced environmental regulation of the government but also to conserve the nature for our descendants.

JG Yang, HSE

### PolyMirae Participates in First Aid Contest Hosted by Yeosu City Office

On October 11<sup>th</sup>, "Disaster response First Aid Contest" was held at Yeosu City Gymnasium to inform the employees of all workplaces in Yeosu National Industrial Complex of disaster responses and to raise safety consciousness. Approximately 30 workplaces in the complex participated in this year's contest, and Assistant Manager Jeong Joon-ho, Staff Ham Soo-hyung, Chief Seo Sung-oh, Chief Park Sung-ho and Staff Kim Han-sol, all without prior record of participation, represented PolyMirae. The participants received training on first aid and disaster response the day before the contest, focusing on various practical activities such as wearing protective equipment, emergency treatment in cases of airway obstruction or amputation, CPR, fracture treatment and emergency removal. The contest served as the opportunity for staffs to attain proficiency in making swift and safe responses in cases of emergency or safety accidents.

JH Jung, HSE

## Regular Toxic Chemicals Handling Facility Inspection

PolyMirae uses sodium hydroxide, a toxic chemical substance. While only a small amount of the substance is used in the process, the plant needs to undergo regular toxic chemicals handling facility inspection once every two years because there exists toxic chemical handling equipment in the plant. This year, Korea Gas Safety Corporation visited Yecheon, Yongseong and Pyeongyeo Plants to conduct inspection on October 23<sup>rd</sup>. This year, each team conducted thorough factual checkup prior to the inspection, and so no problems were pointed out at the actual inspection. Everyone at PolyMirae should make joint efforts to facilitate thorough management of not only toxic but also general chemicals in the future to maintain zero accident workplace.

JG Yang, HSE

## 2018 Global Safety Day

Global Safety Day event, hosted annually by LYB, took place on June 19<sup>th</sup> this year.

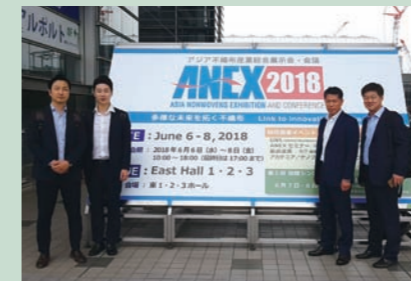
This year's event took place under the theme of "IT'S IN MY HANDS". Special activities including the contest for employees to discover certain parts of the procedure which require improvement and suggest alternatives, and the contest for subcontractors to submit work plans and risk assessment reports for evaluation. Youngjin Technics and Pacific Machine and Technology were each awarded gold and silver medal, in the respective order, at the subcontractor contest. Also, Safety Golden Bell Contest was hosted specially for this year, which the staffs enjoyed very much.

For crisis management and response training, on-site response drills including firefighting drill and rescue & emergency medical service (EMS) training, and team-level crisis management drill took place, and it was assessed that the company needs to strengthen its field control capacity. Also, it was suggested that the Managers of the Plant and Safety Environment Team should designate acting directors beforehand to facilitate cooperation with the investigation of related authorities in case of accidents, and that time limit for response should be set during rescue & EMS training.

TS Kim, HSE



CEO Martino Gabellich and Manufacturing Director KY Yoon pose for the Commemorative Photograph with the Winners of the Subcontractor Contest.



PolyMirae staff visiting ANEX (HOJ Park, JY Park, BH Kim and SH Jung from left side)

## PolyMirae Staff Visit Chinese Clients

Daniel Kim of Market Development Team and Grace Kang of ADTSI Team visited Chinese automotive compounding clients for five days from September 17<sup>th</sup> to 21<sup>st</sup> to review the status of PMC business, the Chinese automobile industry trends and discuss future market forecast. The staff also specifically promoted specialty products as *Metocene* for Low VOC compounds, newly developed products as Super Impact Copolymer products (EP140R/EP5181) and Anti-tiger Stripe Impact Copolymer (EP5175/EP5091). New Super Impact Copolymers can reduce the content of POE in compounds, and they shared successful replacement cases developed in Korea. The visit will greatly contribute to PMC market development efforts.

SH Jung, Sales•Market Development

## PolyMirae Participates in 2018 ANEX (ASIA Nonwovens Exhibition and Conference)

ANEX (Asia Nonwovens Exhibition and Conference), one of the world's biggest nonwoven exhibitions in the world took place in Tokyo, Japan from June 6<sup>th</sup> to 8<sup>th</sup>. ANEX is one of the three biggest nonwoven exhibitions in the world, alongside INDEX of Europe hosted by EDANA (European Disposables and Nonwovens Association) and IDEAD of the U.S. hosted by INDA (Association of the Nonwoven Fabrics Industry). More than 300 companies from all around the world including Korea, China, Germany, India, France, the U.K., Singapore and Italy participated in the exhibition to present their products and technological capacities and forecasted the future of the industry. Executive Director BH Kim and staff of ADTSI attended this year's ANEX to review development trends of the market and more specifically also to meet with 23 current and perspective clients (Berry Plastics, Fibertex Nonwoven, Saudi Advanced fabric, CNC, etc.) with BAP and DAECO support, our two export channels, to review pending business issues and better understand clients' needs. Furthermore, PolyMirae's delegation introduced new products including *Metallocene* Melt-blown, PolyMirae's representative specialty product developed through the combination of LYB's advanced catalyst system and PolyMirae's cutting-edge manufacturing technology.

SH Jung, Sales•Market Development

### PolyMirae Staff Visit Southeast Asian Clients

Director GY HA and CH Lim of ADTSI Team, and HOJ Park of Market Development Team visited global nonwoven clients in Southeast Asia as well as locally based Japanese trading companies for five days from August 20<sup>th</sup> to 24<sup>th</sup> to review current conditions of Southeast Asian Polypropylene market, future market forecasts and discuss business growth with our customers. Southeast Asia is a market offering several business opportunities, and through the visit PolyMirae employees were able to meet all local large nonwoven client enterprises as well as new perspective clients, to introduce the excellence of our products once more and reconfirm stable supply in the future, expanding business opportunities.

SH Jung, Sales-Market Development

### 2018 Wage and Labor Collective Agreement Signing Ceremony

On November 1<sup>st</sup>, 2018, the signing ceremony for the 2018 Wage and Labor Collective Agreement between the labor union and the company took place at the Conference Hall in the Main Building of the Plant. Union Leader CHY Park, & other union representatives, and representatives of the company including CEO Martino Gabellich, Plant Manager KY Yoon and staff of HR-ER Team attended the signing ceremony to sign the new Wage and Labor Collective Agreement. At the ceremony, the CEO congratulated all parties for negotiating the agreement in a fair and mutually respectful manner based on professionalism. This year's Wage and Labor Collective Agreement Council was first convened on June 28th and continued negotiation lasted for approximately 3.5 months, with the objective to maintain healthy labor-management relations.

KB Chun, HR-ER



CEO Martino Gabellich (Left) and Union Leader CHY Park (Right) shake hands after signing the Agreement

### PolyMirae Staff Visit Chinese Melt-blown Client

JY Park of Technology Team and HOJ Park of Market Development Team visited Global Melt-blown Company in China for five days from September 10<sup>th</sup> to 14<sup>th</sup> to review Chinese Nonwoven market, pending business issues and client needs.

Chinese PP market boasts enormous scale, accounting for 40% of the entire global market, with fierce competition. Through the visit PolyMirae was able to introduce the excellence of the company's products once more, and cultivate business opportunities through discussions with the client on future product development targets.

SH Jung, Sales-Market Development

### 2018 Employee Engagement Survey Conducted

PolyMirae conducts an Employee Engagement Survey every year to measure overall satisfaction of all employees and develop plans to establish a better work environment by discovering opportunities for improvement. This year, with the support of the Korn Ferry Hay Group, PolyMirae conducted the Employee Effectiveness Survey to benchmark satisfaction of employees of PolyMirae and other enterprises.

Employee Effectiveness Survey is based on Korn Ferry Hay Group's methodology which measures how satisfied the employees are and how effectively they work based on organizational engagement and degree of empowerment. The Survey was conducted on-line, with an exceptionally high participation rate of 98%.

The results of the survey were analyzed based on 7 areas related to voluntary engagement (Provision of clear and definite direction, trust in the leader, respect and recognition, quality and client-centered business, development opportunity, and wage and welfare) and 6 areas related to the degree of empowerment (performance management, authority and empowerment, available resources, training, cooperation, and work/structure/process), and the points which require improvement were derived from survey results and shared with all executives and staff.

The executives and employees of PolyMirae sympathize with the results, and will make new efforts to make the company a well-performing organization and at the same time a great workplace, based on concrete plans.

Jessica Kim, HR-ER

# Moplen EP310J HP/Moplen EP310J

## Best solution for retort packaging

PolyMirae has developed the new *Moplen EP310J HP/Moplen EP310J* for the extrusion of films used for lamination on other substrates, which is highly appreciated by customers in the production of applications that can be processed under high retorting conditions. *Moplen EP310J HP/Moplen EP310J* offers good processability on cast and blown lines.

This polypropylene heteropahsic copolymer exhibits high impact, good puncture, good tear resistance, high seal strength and seal integrity.



*Moplen EP310J HP/Moplen EP310J*