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Education:

Ph.D. in Chemical Engineering, National Taiwan University, 2020
M.S. in Polymer Engineering, National Taiwan University of Science and Technology, 2009
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Career:

2021-now Engineer, China Steel Corporation, Taiwan
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Research Interests:

Carbon capture and utilization, 3D printing, Biomaterials and Polymer application

Publications:

(1) Chih-Chin Hsu, Chen-Chih Hsu, Che-Min Lin, Da-Ming Wang and Hsyue-Jen Hsieh, "Fabrication of polycaprolactone scaffolds filled with cell-compatible porous matrix for enhanced cell growth for biomedical applications", *Journal of Applied Polymer Science*, 2023, 140, e54432.

(2) Fu-Lung Yeh, Shang-Lin Chang, Golam Rizvee Ahmed, Hsin-I Liu, Luh Tung, Chung-Shu Yeh, Leah Stands Lanier, Corina Maeder, Che-Min Lin, Shu-Chun Tsai, Wan-Yi Hsiao, Wei-Hau Chang and Tien-Hsien Chang, "Activation of Prp28 ATPase by phosphorylated Npl3 at a critical step of spliceosome remodeling", *Nature Communications*, 2021, 12, 3082.

(3) Che-Min Lin, Yung-Chi Chang, Li-Chang Cheng, Chao-Hsien Liu, Shin C. Chang, Tzu-Yang Hsien, Da-Ming Wang and Hsyue-Jen Hsieh, "Preparation of graphene-embedded hydroxypropyl cellulose/chitosan/polyethylene oxide nanofiber membranes as wound dressings with enhanced antibacterial properties", *Cellulose*, 2020, 27, 2651-2667.

(4) Ting-Yun Kuo, Che-Min Lin, Shih-Chieh Hung, Tzu-Yang Hsien, Da-Ming Wang and Hsyue-Jen Hsieh, "Incorporation and selective removal of space-forming nanofibers to enhance the permeability of cytocompatible nanofiber membranes for better cell growth", *Journal of the Taiwan Institute of Chemical Engineers*, 2018, 91, 146-154.

(5) Ting-Yun Kuo , Cuei-Fang Jhang , Che-Min Lin , Tzu-Yang Hsien and Hsyue-Jen Hsieh,

"Fabrication and application of coaxial polyvinyl alcohol/chitosan nanofiber membranes", *Open Physics*, 2017, 15, 1004-1014.

(6) Ruei-Yi Tsai, Ting-Yun Kuo, Shih-Chieh Hung, Che-Min Lin, Tzu-Yang Hsien, Da-Ming Wang and Hsyue-Jen Hsieh, "Use of gum arabic to improve the fabrication of chitosan–gelatin-based nanofibers for tissue engineering", *Carbohydrate Polymers*, 2015, 115, 525-532.

(7) Ruei-Yi Tsai, Pin-Wen Chen, Ting-Yun Kuo, Che-Min Lin, Da-Ming Wang, Tzu-Yang Hsien and Hsyue-Jen Hsieh, "Chitosan/pectin/gum Arabic polyelectrolyte complex: Process-dependent appearance, microstructure analysis and its application", *Carbohydrate Polymers*, 2014, 101, 752-759.

捕碳再利用-鋼鐵製程邁向低碳化

林哲民

中鋼公司 綠能與系統整合研究發展處

碳中和是全世界致力達成的目標，中鋼公司為我國鋼鐵業的龍頭企業，不僅供應各業生產必須之鋼鐵產品，亦持續推動環境永續發展工作。鋼鐵業是能源密集的產業，高爐-轉爐製程乃生產鋼鐵產品的上游產線，鐵礦於高爐以焦炭還原成鐵水，再於轉爐以純氧吹煉成純淨鋼液，過程會產生一氧化碳(CO)、二氧化碳(CO_2)等副產氣體，是整體鋼鐵製程最大的碳排放源，過去是將副產氣體作為燃料供應給加熱爐供熱或燃氣發電，滿足下游產線對熱及電力的需求。「鋼化聯產」是跨鋼鐵及石化兩大產業之新合作模式，CO 是石化業合成化學品的既用原料，CO_2 則是萬眾期盼透過碳捕捉再利用(CCU)技術實踐減碳的原料，中鋼藉由化學吸收法或物理吸附法等成熟捕碳技術，捕捉及純化副產氣中的 CO 及 CO_2，將其提供給石化業，替代既用原料，以既有製程合成如甲烷、甲醇、醋酸等泛用化學品或衍生的塑化製品，達成固碳目的，如此中鋼可減少排碳，降低捕碳成本，石化業亦可減少使用石化原料及生產 CO 必要的能源，既可促兩大產業實踐減碳，亦能創造新興低碳循環經濟產業鏈。

Carbon Capture & Utilization: Lower CO_2 Emission of Steelmaking Industry

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Carbon neutrality is a goal that the world is striving to achieve. CSC is a leading company in Taiwan' s steelmaking industry, which not only supplies necessary steel products for various industries but also continues to promote environmentally sustainable development. The steelmaking industry is an energy-intensive industry. The blast furnace-basic oxygen furnace process is the upstream process for the production of steel products. Iron ore is reduced to molten iron with coke in the blast furnace and then blown into pure molten steel with pure oxygen in the converter. The process will produce carbon monoxide (CO), carbon dioxide (CO2) and other by-product gases are the largest source of carbon emissions in the overall steel production process. In the past, by-product gases were used as fuel to supply heating furnaces or gas-fired power generation to supply the heat and power needs of downstream processes. The "Co-production of Steel and Chemicals" is a new cross-industry collaboration model. CO is one of the raw materials used for synthesizing chemicals in the petrochemical industry, while CO2 is the key to reducing carbon emissions by using carbon capture and utilization techniques (CCU). In the future, CO and CO2 extracted from the by-product gases provided by CSC can replace raw materials for chemicals that have to be imported by the petrochemical industry from abroad and can be used to synthesize chemicals such as methane, methanol, and acetic acid through various processes in the petrochemical industry. By fixing carbon in the chemicals and plastic products, both industries can reduce carbon emissions. This strategy not only reduces carbon emissions but also breaks new ground in the low-carbon circular economy industry chain.