Transformation of ^{14}C-labeled graphene to $^{14}CO_2$ in the shoots of a rice plant

Supported by the National Natural Science Foundation of China, a research team led by Dr. Mao Liang (毛亮) at the School of the Environment, Nanjing University, suggested that graphene was degradable to CO_2 in the shoots of a rice plant, which was published in *Angewandte Chemie-International Edition* (2018, 57: 9759—9763).

Graphene has raised an extraordinary interest in both academia and industry due to its unique properties. During the last five years, the production volume of graphene family materials exponentially increased globally. In China, for instance, the total annual production capacity of graphene sheets and films has exceeded 400,000 kg and 110,000 m^2, respectively. As graphene in products may be released into the natural environment, its toxicity to terrestrial plants has been broadly explored; however, its uptake, transport, distribution and degradation within plants remain poorly understood because of the difficulty in tracing this material in biological systems.

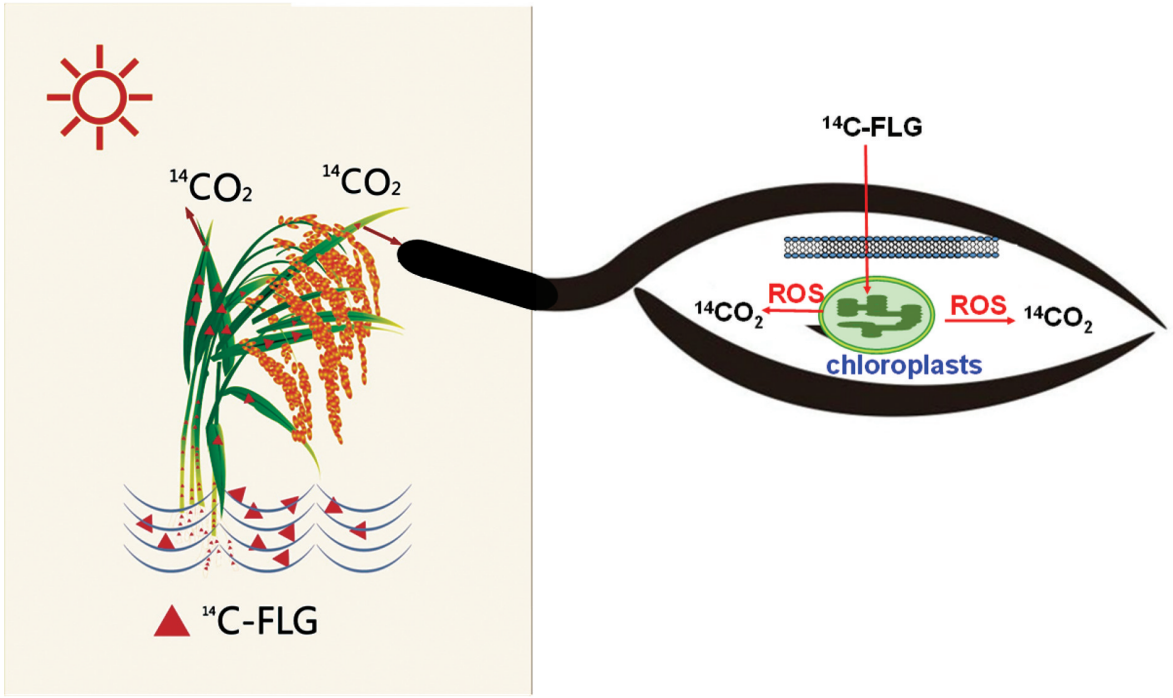

Figure Uptake and transformation of 14C-labeled graphene in rice plants.

Dr. Mao's group has developed carbon-14 labeled few-layer-graphene (FLG), which allowed them to trace graphene in multiple species in a quantitative fashion for the first time. In this study, FLG was found passing through the cell wall and membrane and entering the chloroplasts. However, ^{14}C-FLG was degraded to be $^{14}CO_2$ in the shoots of the plants and could not be detected in the generated seeds. This study has answered the fundamental questions about the distribution and transformation of graphene family materials after uptake by rice plants using carbon-14 labeled FLG. This newly discovered degradation mechanism might have an important impact on the long-term environmental fate of these nanomaterials in soil ecosystems and therefore requires further research. Importantly, no detectable concentrations of FLG were found in food crops, indicating that the consumption of rice crops exposed to FLG would be safe.