FlowPhotoChem publication lay summary

Title	Scale-Up of a Heterogeneous Photocatalytic Degradation Using a Photochemical Rotor-Stator Spinning Disk Reactor
Author of summary and organization	Stefan D. A. Zondag – Universiteit van Amsterdam
Aims	The aim of this research is to expand the possibilities of continuous-flow photochemistry. Currently, large-scale and solid-containing (heterogeneous) photochemistry is underrepresented in this field because of the associated complications in processing. The goal is to enable this type of chemistry at larger scale, tackling both the current scale-up and solids-handling issues encountered in this field.
Why is this important?	The use of solid catalysts in flow chemistry is plagued by clogging and poor mixing, resulting in limited reported applications and inhibiting large-scale incorporation. This causes researchers to investigate alternatives without solids. Apart from the time and effort this requires, this introduces more complex and costly separation methods in comparison to the easy separation of solids from liquids by filtration.
What methods were used?	A custom reactor is used to demonstrate solid-containing photochemical wastewater purification. This purification uses a non-toxic solid catalyst, air or oxygen and wastewater. The reactor contains a window to allow light to shine into the system. A fast rotating disk inside the reactor ensures that the solids are efficiently mixed with the wastewater and gas in such a way that they cannot settle and clog the reactor.
What was learned?	The custom reactor, called the “photochemical rotor-stator spinning disk reactor”, enabled the continuous processing of the complex solid-liquid-gas mixture. This was achieved by the efficient mixing provided by the rotating disk, effectively preventing clogging of the reactor at all tried conditions. This design provides a basis for process intensification for this type of photochemical transformation.
How could this research benefit citizens, society and other researchers?	Continuous processing in photochemistry is regarded as a relatively new and sustainable development. This field can contribute greatly to pharmaceutical and industrial chemistry, both in reducing energy consumption due to the mild reaction conditions and reduction of generated waste. However, the issues associated with scaling up and solids handling inhibit widespread application. This research contributes to bridging the gap of lab-scale to large-scale, bringing us closer to more sustainable process intensification in the future of the field.
Link to full paper/abstract	https://doi.org/10.1021/acs.oprd.2c00012