Sustainable chemistry will not solve CO2 emissions problem, claims paper

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In a paper published in the journal *Sustainable Chemistry for Climate Action*, Prof. Gadi Rothenberg of the Van 't Hoff Institute for Molecular Sciences presents a realistic look at carbon dioxide emissions, climate

change and the role of sustainable chemistry. Using simple back-of-the-envelope calculations he shows that the climate goals of the Paris Agreement are beyond reach. According to Rothenberg, humanity should prepare for living in a world where average temperatures are 3–4 °C higher than in pre-industrial times.

Countries with developed economies lead the way towards emission reductions, but these are small in comparison to populous countries in Africa and Asia where improving the quality of life comes with a continuing operation of coal, oil and gas power plants. And even in the part of the world that does have the potential for a sustainability transition, changes will not be imminent. In general, greenhouse gas concentrations are considered a long-term problem, and their emissions as externalities. As a result there is little economic incentive for replacing incumbent technologies.

As professor in heterogeneous catalysis and sustainability, Rothenberg dedicates his career to improving chemistry so that it is more efficient, more sustainable, more "green." However, he argues, even the best research in sustainable chemistry will not make a sizable dent in CO_2 emissions.

Green chemistry can help in better resourcing and in minimizing waste, promoting a circular economy. But its contribution to lowering emissions is limited to the chemicals, petrochemicals, and (partially) transport and energy storage sectors. Together these account for less than 15% of global emissions.

Reality check

Rothenberg notes a media hype surrounding discoveries in sustainable chemistry and sustainable energy. As such, this may help scientists and companies working in these areas, but he calls for a reality check.

"Optimistic scenarios are useful because they show us what could happen if all factors line up for solving a problem. But they also encourage the view that 'things are fine' and 'every little bit helps.' The truth is that large-scale problems cannot be solved by small-scale actions."

Despite this rather gloomy outlook, Rothenberg argues we should by no means give up: "We must keep on developing and implementing sustainable technologies. But we should also prepare to adapt to living in a world with average temperatures 3–4 °C higher than pre-industrial times. Optimistic scenarios make people complacent. Wake up. It is later than you think."

More information: Gadi Rothenberg, A realistic look at CO2 emissions, climate change and the role of sustainable chemistry, *Sustainable Chemistry for Climate Action* (2023). DOI: 10.1016/j.scca.2023.100012

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