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## Photo-catalytic reduction of carbon dioxide by means of different titania-based catalysts synthesized with high pressure fluids

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According to the latest IPCC Climate Change Synthesis Report the human influence on the climate is clear, being recent anthropogenic emissions of greenhouse gases (GHGs) the highest in the history. In particular, CO<sub>2</sub> emissions from fossil fuel combustion contributed about 78% of the total GHG emission increase from 1970 to 2010, and these GHG emissions are expected to grow in all sectors. In order to reduce emissions and mitigate storage concerns, conversion technologies utilize the emitted CO<sub>2</sub> to produce other valuable products usually through catalytic chemical reactions. Given the high stability of CO<sub>2</sub> molecule, there is need for processes with high conversion and yield. These objectives can be achieved with improved catalysts and reaction systems designs. Our group has acquired experience in photo-catalytic reduction of CO<sub>2</sub>. In this sense, we have taken advantage of the special properties of compressed fluids (they can diffuse through solids like a gas but dissolve materials like a liquid) as particle formation media to synthesize TiO<sub>2</sub>-based catalysts with enhanced features. In particular, the photo-catalytic behavior of TiO<sub>2</sub> can be improved with the dispersion of metal atoms (Pt, Pd and Cu). This process has been undertaken simultaneously with supercritical synthesis in our ad hoc design experimental set-up, obtaining metal-doped TiO<sub>2</sub> with high surface area, crystallization degree, hydroxyl concentration, large pore volume, improved absorbance in visible range, etc. As a result, they show higher conversion rates than commercial catalyst (22-fold in methane and 5-fold in CO) in reduction experiments developed in an ad hoc designed experimental set-up.

### Biography

Rafael Camarillo is an Associate Professor of Chemical Engineering in University of Castilla-La Mancha, Spain. Although he completed his PhD about wastewater treatment with membrane processes, he has extended his area of interest to different operations with supercritical fluids (regeneration of used frying oils, extraction of valuable compounds from wastes, etc.). In last decade his group has specialized in CO<sub>2</sub> conversion through photo- and electro-catalysts obtained under supercritical conditions. He has published about 30 papers in reputed journals and has attended 47 international and national congresses (16 oral and 50 poster presentations).

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