# New catalysts recovery project to reduce sulfur emissions in refineries

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Wanting to improve the catalysts used in sulfur recovery plants of Pemex Gas and Basic Petrochemicals (PGPB; Pemex is an oiling Mexican company), the Mexican Oil Institute (IMP) developed a titanium dioxide reactivation project implemented in the Claus process.

Ph.D. Roberto Garcia, project manager of the Research Directorate of the IMP, explains that the Claus and Super Claus processes reduce sulfur emissions generated by a refinery, using materials called catalysts, which adsorb the chemical element.

"Crude oil contains sulfur, and during the transformation processes of hydrocarbon, it is removed; however, the waste needs to be treated with an active catalyst in order to avoid emissions that pollute and can produce acid rain," says the IMP researcher.

Titanium oxide catalysts that remove sulfur are used, but over time, they are deactivated and reactivation or replacement is necessary.

The research focuses on the catalytic recovery in the Super Claus process. Dr. Cruz is also analyzing which chemicals deactivate the catalyst. He looks for technological alternatives to replace or reuse the wasted material.

The innovation could be beneficial for Pemex, because it can cut costs invested in a new catalyst, which is purchased at an average of $ 10k per tonne.

The project was divided into three self-sustaining lines of research: reactivation of the titanium oxide catalyst spent during physicochemical processes, treatment for disposal by biotechnological methods, and evaluation of new alternative catalyst formulas.

In the first line of reactivation research, titanium oxide catalyst property was recovered by up to 20 percent, avoiding the purchase of a new one.

Roberto García de León says that in the second line of research, bacteria from sulfur water areas were analyzed and modified to achieve a higher resistance to the chemical element. Furthermore, DNA sequencing was performed for the taxonomic identification of the strain.

The biological treatment system proved capable of removing between 91 and hundred percent of the sulfur in the catalyst over a period of 21 to 35 days.

Registration and deposit of two bacterial cultures in the German Microbial Culture Collection was also achieved, which yielded a patent and made it available for the Mexican and international companies.

The third line of this investigation chose the best catalyst systems for selective oxidation if the sulfur were selected, where three groups were defined: titanium nanotubes, catalytic systems of titanium oxide and mesoporous stabilized materials stabilized.

These systems were obtained from the mesoporous material modified with iron, and a series of catalysts from silicon oxide were found. "In this research we removed the chromium in oxidation state 6, which is not friendly to the environment because it can be carcinogenic," said Roberto Garcia.