

## TiO<sub>2</sub>-induced photoisomerization of caffeic acid

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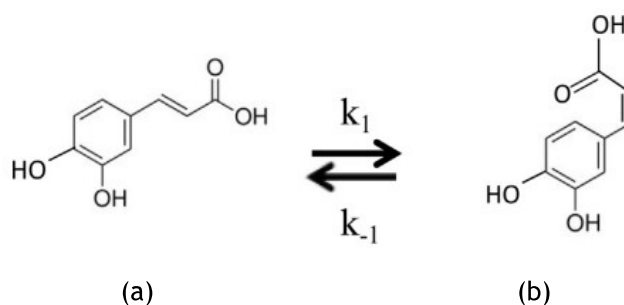
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### ABSTRACT

In this work we report the isomerization of trans-caffeic to cis-caffeic acid under UV light irradiation in the presence of different TiO<sub>2</sub> photocatalysts at different pH values.

**Keywords:** photoisomerization, caffeic acid, titanium dioxide

Caffeic acid is an organic compound naturally present in plant kingdom belonging to hydroxycinnamic acid. The light induced isomerization of these family of acid is known in the literature[1] but it has not been studied in the presence of a catalyst. In this work we investigate the extent of the photoisomerization of trans-caffeic acid both in absence and in presence of various titanium dioxide powders at different pH values (3.5, 6 and 8) in order to understand the role of the catalyst and the mechanism of the process. The runs were carried out in a cylindrical photoreactor irradiated by fluorescent lamps whose main emission peak was in the near-UV region at 365 nm by bubbling nitrogen. Two commercial TiO<sub>2</sub> samples (Degussa P25 and Merck) and a home-prepared TiO<sub>2</sub> sample (HP0.5) were used as catalysts. The photoisomerization (Figure 1) proceeded until a photo-stationary state was reached and a constant value of the cis/trans ratio was obtained. In all cases the higher degree of isomerization was observed for higher pH values. The cis/trans ratio found in homogeneous phase was 1.8. This value decreased to 1.6 in the presence of Merck and reached 2.0 and 2.2 in the presence of P25 and HP05 respectively. This finding indicates that the isomerization of trans-caffeic to cis-caffeic acid was influenced by the presence of the photo-catalyst. In particular Merck was slightly detrimental while P25 and HP05 favored the isomerization. The reason of this different behavior can be attributed to the low adsorption ability of Merck with respect to P25 and HP05 samples.



**Figure 1:** Trans-caffeic (a) and cis-caffeic (b) acid.

### References

- [1] A. Le Person, A.S. Lacoste, J.P. Cornard, *Journal of Photochemistry and Photobiology A: Chemistry*, 265, 10-19, (2013).