



Evaluation of the Microwave-Photo Fenton Reaction in the Decomposition of Pesticide Residues

Caio F. Gromboni^{a,b}, Marcos Y. Kamogawa^{a,b}, Ana Rita A. Nogueira^{b*}, Joaquim A. Nóbrega^a

Grupo de Análise Instrumental Aplicada – GAIA:

^aDepartamento de Química, UFSCar, S. Carlos SP, Brazil

^bEmbrapa Pecuária Sudeste, C.P. 339, 13560-970, S. Carlos SP, Brazil.

* E-mail: anarita@cnpse.embrapa.br

The application of pesticide products is commonly used for control the bovine ticks (*Boophilus microplus*). The products can be applied in different ways: injected, pour on, immersion, or aspersion. In those last ones, about 4-5 liters of solution prepared with the active product is used, to take a bath for each bovine adult. The discard of the remaining solution is a considerable environmental problem. In view of that, photo oxidative procedures, successfully used to degrade several agricultural defensives, were evaluated to degrade a solution of 1:400 (v/v) of Supocade[®] (chlorfenvinfos 13.8% and cipermetrine 2.6%), used for cattle ticks control.

The utilization of two radiation sources, microwave and UV, and the Fenton reaction¹, with addition of Fe²⁺-Fe³⁺ solution was used focusing on oxidation of the organic matrix present in the pesticide residue. This approach was performed with the use of a focused microwave digestion with open vessels (Star 6, CEM). Ultraviolet radiation was generated with special lamps, activated by microwave radiation, the so-called microwave lamps (MWL)². The experiments were performed (with and without MWL): changing pesticide volume from 9 to 30 mL and different oxidant mixture: Fe²⁺-Fe³⁺ from 1000 to 6000 mg L⁻¹ and H₂O₂ (30%) from 0.5 to 6.0 mL. The different solutions were submitted to MW radiation during 6 min at 140°C. An inductively coupled plasma optical emission spectrometer (ICP OES) was used to residual carbon content (RCC) determination.

The volume of 9 mL of pesticide was degraded with 1.5 mL H₂O₂ and 1.5 mL Fe²⁺-Fe³⁺ 1000 mg L⁻¹ when submitted to MW-UV radiation. Microwave radiation was responsible by about 40% of degradation. The UV, by others 40% and, combined with Fenton reaction, the organic components were totally destroyed, resulting in overall digestion efficiencies of 95 ± 2% relating to RCC in the pesticide residue. The union of MW-UV radiation and Fenton reaction improved the reaction, increasing the hydroxyl radicals used to destroy the organic present in solution.

Acknowledges: FAPESP and CNPq

1. Fenton, H.J.H., J. Chem. Soc., 65, 899, 1894.
2. Florian, D., Knapp, G., Anal. Chem., 73, 1515, 2001.

Evaluation of the microwave
2004

SP-2004.00141



15413-1