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Development of a New Characterization Method to Analyse Cypermethrin Penetration in Wood Material by Immunolabelling

Authors : Sandra Tapin-Lingua, Katia Ruel, Jean-Paul Joseleau, Daouia Messaoudi, Olivier Fahy, Michel Petit-Conil

Abstract : The preservative efficacy of organic biocides is strongly related to their capacity of penetration and retention within wood tissues. The specific detection of the pyrethroid insecticide is currently obtained after extraction followed by chemical analysis by chromatography techniques. However visualizing the insecticide molecule within the wood structure requires specific probes together with microscopy techniques. Therefore, the aim of the present work was to apply a new methodology based on antibody-antigen recognition and electronic microscopy to visualize directly pyrethroids in the wood material. A polyclonal antibody directed against cypermethrin was developed and implement it on Pinus sylvestris wood samples coated with technical cypermethrin. The antibody was tested on impregnated wood and the specific recognition of the insecticide was visualized in transmission electron microscopy (TEM). The immunogold-TEM assay evidenced the capacity of the synthetic biocide to penetrate in the wood. The depth of penetration was measured on sections taken at increasing distances from the coated surface of the wood. Such results correlated with chemical analyzes carried out by GC-ECD after extraction. In addition, the immuno-TEM investigation allowed visualizing, for the first time at the ultrastructure scale of resolution, that cypermethrin was able to diffuse within the secondary wood cell walls.

Keywords : cypermethrin, insecticide, wood penetration, wood retention, immuno-transmission electron microscopy, polyclonal antibody
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