

**ZEOLITES FUNCTIONALISED WITH ESSENTIAL OILS AS NEW
FUNGICIDAL MATERIALS FOR CITRUS FRUITS**

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Postharvest diseases produced by fungi are one of the main problems affecting the quality of agricultural products during storage. In citrus fruits, the largest economic losses are caused by wound pathogens, in particular, by *Penicillium digitatum* (PD), *Penicillium italicum* (PI) and *Geotrichum citri-aurantii* (GC), causing citrus green mould, blue mould and sour rot, respectively. Nowadays, there is not a unique fungicide authorized by the European Union for the effective treatment of these three postharvest diseases. Therefore, many studies have been carried out to search for biocidal materials that provide multiple control. Previous studies made by our work group have shown that zeolitic materials functionalised with silver are active materials for the treatment of oranges infected by these fungi. Nevertheless, the release of silver may be a problem due to the strict regulations associated to food products and new alternatives are necessary. In this work, we studied the use of thyme and cinnamon essential oils supported on zeolites as biocidal agents against PD, PI and GC. *In vitro* studies using Faujasite zeolites impregnated with different quantities of essential oils showed very high growth inhibition of all three fungi, with thyme essential oil giving the best results. In subsequent *in vivo* studies, LTA and MCM-22 zeolites synthesized from silica extracted from rice husks, silica and a pillared clay with 20% by weight of thyme essential oil were applied to oranges artificially inoculated with the fungi. Results showed that the antifungal activity was highly dependent on the type of fungus and the material used. The most active antifungal material was LTA zeolite with 20% thyme essential oil. However, fruit disease reduction was much lower than *in vitro* fungal inhibition, indicating that further optimization of the antifungal material is still necessary.

Oral talk
 Short talk

Intention to submit to Catalysis Today YES
 NO