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Molecularly imprinted polymers for the removal of iprodione from wine: experimental design and synthesis optimization
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Introduction
Substantial evidence demonstrates the potential for transfer of fungicides during the winemaking process. In order to remove these fungicides from wine samples, molecularly imprinted polymers (MIP) have been prepared and tested in a hydro-alcoholic solution containing iprodione. Iprodione was chosen as fungicide because it was detected in more than 90% of the French wine according to a survey done by the French ministry of agriculture [1].

Materials and methods

1- Synthesis

Iprodione-MIPS’ non-covalent synthesis

Template

Porogen solvent

Initiator

2,2-dimethoxy-2-phenyl acetoephone (DMPAP)

Under UV radiation

2nd factorial experimental design

Factor 1

Functional Monomer (FM)

• -1 Methacrylamide

• +1 Methacrylamide + styrene

Factor 2

Crosslinker (C)

• -1 Trimehylolpropane trimethacrylate (TRIM)

• +1 Ethylene glycol trimethacrylate (EGDMA)

Factor 3

Polymerization method (PM)

• -1 Monolith

• +1 Precipitation

8 iprodione-MIPS

2- Template removal

acidic alcohol + ultrasonication

3- NIPs synthesis

8 NIPs were synthesized in a similar manner without template

4- Binding experiments

Iprodione solutions

• 20 mL ethanol/water

• 10^3 M < [Iprodione] < 10^2 M

• 10 mg polymer

• 25°C

Extraction

• Batch extraction

• Magnetic stirring

Freundlich isotherms

B = a F^m

B : binded iprodione

F : free iprodione

a, m : Freundlich parameters

5- Response variables

• K : apparent weighted average affinity

• N : apparent number of sites

• K(MIP)/K(NIP)

Results

The optimal MIP : MIP5

• F1 : precipitation

• F2 : TRIM

• F3 : methacrylamide

Conclusion

The addition of styrene decreases the apparent affinity and the sites number.

The use of TRIM increases the apparent affinity and K(MIP)/K(NIP).

The precipitation polymerization increases the apparent affinity and the sites number.