## Supplementary information for

## Integrated nanotechnology about synergism and degradation for

fungicide SOPP by micro/nano-Ag<sub>3</sub>PO<sub>4</sub>

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## 1. Characterization of the Ag<sub>3</sub>PO<sub>4</sub> sample

The Raman spectroscopy analysis showed an intense band at 922 cm<sup>-1</sup> and weak broader band at 1012 cm<sup>-1</sup>, which could be attributed to the symmetric and asymmetric stretching vibrations of  $PO_4^{3-}$  groups (Fig. 1a). In the infrared spectrum (IR), a strong absorption band at 548 and 1019 cm<sup>-1</sup> could be assigned to the vibrations of  $PO_4^{3-}$  groups (Fig. 1b). This result suggested the formation of Ag<sub>3</sub>PO<sub>4</sub>, in consistence with the XRD and Raman results. From the ultraviolet–visible diffusive reflectance spectrum (UV-DRS), it can be seen that the as-prepared Ag<sub>3</sub>PO<sub>4</sub> had a strong absorption towards the visible light with a wavelength shorter than 530 nm (Fig. 1c). The band gap of the as-prepared Ag<sub>3</sub>PO<sub>4</sub> sample was about 2.35eV, as indicated by the relationship of  $(ahv)^2$  and hv (Fig. 1d). The narrow band gap indicated the potential photocatalytic property of the Ag<sub>3</sub>PO<sub>4</sub> sample in the visible light range.



Supplementary Figure 1. Raman (a), FTIR (b) and UV-DRS (c, d) spectra of Ag<sub>3</sub>PO<sub>4</sub> micro/nano-crystals

2. Chemical element mapping analysis of the Ag<sub>3</sub>PO<sub>4</sub>-SOPP sample

The images clearly show the presence and distribution of O, P, Ag and C on selected area.



Supplementary Figure 2. EDS mapping images of Ag<sub>3</sub>PO<sub>4</sub> – SOPP composite system

3. UV-Vis analysis of SOPP solution after introducing Ag<sub>3</sub>PO<sub>4</sub> micro/nano-crystals



Supplementary Figure 3. UV-Vis spectrum of SOPP solution after introducing Ag<sub>3</sub>PO<sub>4</sub> micro/nano-crystals

4. Investigation of the antifungal activity of  $Ag^{\scriptscriptstyle +}$  ions.



 $Supplementary\ Figure\ 4.\ Antifungal\ activities\ of\ Ag^+\ ions\ released\ from\ 0.025\ (a),\ 0.05\ (b)\ and\ 0.1\ (c)\ g/L\ Ag_3PO_4.$ 

5. Synergy factors for Ag<sub>3</sub>PO<sub>4</sub>- Cyproconazole combinations

$Ag_{3}PO_{4}+$ Cyproconazole (g/L +	Expected inhibition (%)	Observed inhibition (%)	Synergy factor	
g/L)				
0.025 + 0.000125	81.33688	62.91271	0.773483	
0.025 + 0.00025	98.68098	61.55586	0.623786	
0.025 + 0.0005	115.7647	61.55586	0.531733	
0.025 + 0.001	122.0589	74.89824	0.613624	
0.025 + 0.002	147.6843	98.19086	0.66487	
0.1 + 0.000125	86.20907	69.11197	0.801679	
0.1 + 0.00025	103.5446	71.14972	0.687141	
0.1 + 0.0005	120.62	69.96997	0.580086	
0.1 + 0.001	126.9111	71.68597	0.564852	
0.1 + 0.002	152.5239	95.281	0.624696	

Supplementary Table 1 Synergy factors for $Ag_2PO_4$ - Cyproconazole combination			-	-						
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$\alpha \alpha \beta \beta \beta \alpha \alpha \beta \gamma \beta \alpha \beta \beta \gamma \beta \beta \beta \beta \beta \beta $	Subbiementary		SVIICIEV	laciors	101 A	123F U4-	CVDI	oconazoie	combinatio	IIS.