Supporting Information

Figure S1. Evolution of the UV-vis absorption spectra of tyramine solutions (1 mM) (A) and dopamine solutions (B) during the enzymatic reaction in carbonate buffer at pH 6.8 over 24 h (diluted 10-fold before the measurement of the spectrum). (C) Digital pictures of catecholamine oxidation in the presence of 20 U/mL of tyrosinase.

Figure S2. Kinetics of film deposition of tyramine or dopamine in the presence of 20 U/mL of tyrosinase.
Figure S3. AFM image of a representative region of the ψ-PDA film sample, after 1 h of deposition onto the quartz crystal sensor, in the presence of 50 U/mL (A) and 100 U/mL (B) tyrosinase, respectively. Roughness: 28.7 nm (A), 12.8 nm (B). Film thickness: 63.3 ± 5 nm (A), 58 ± 4 nm (B).

Figure S4. Segmental spectra of MALDI-ToF (m/z: 550–800 Da) characterizations of (A) tyramine film in carbonate buffer at pH = 6.8 with 20 U/mL of tyrosinase and (B) PDA film obtained under the same conditions.
**Figure S5.** EC$_{50}$ values obtained from the DPPH assay of the samples obtained by oxidation of tyramine and dopamine in the presence of 20 U/mL of tyrosinase (2 mg/mL). The average values ± SD obtained from at least three separate experiments are reported.

![Figure S5](Image)

**Figure S6.** Trolox equivalents determined in the FRAP assay of the samples obtained by oxidation of tyramine and dopamine in the presence of 20 U/mL of tyrosinase (2 mg/mL). The average values ± SD obtained from at least three separate experiments are reported.

![Figure S6](Image)

**Figure S7.** Calcium alginate hydrogel films on glass (A) or polystyrene (B) loaded with an 1% aqueous solution of tyrosinase and dipped into tyramine solution (1 mM) for 2 h.