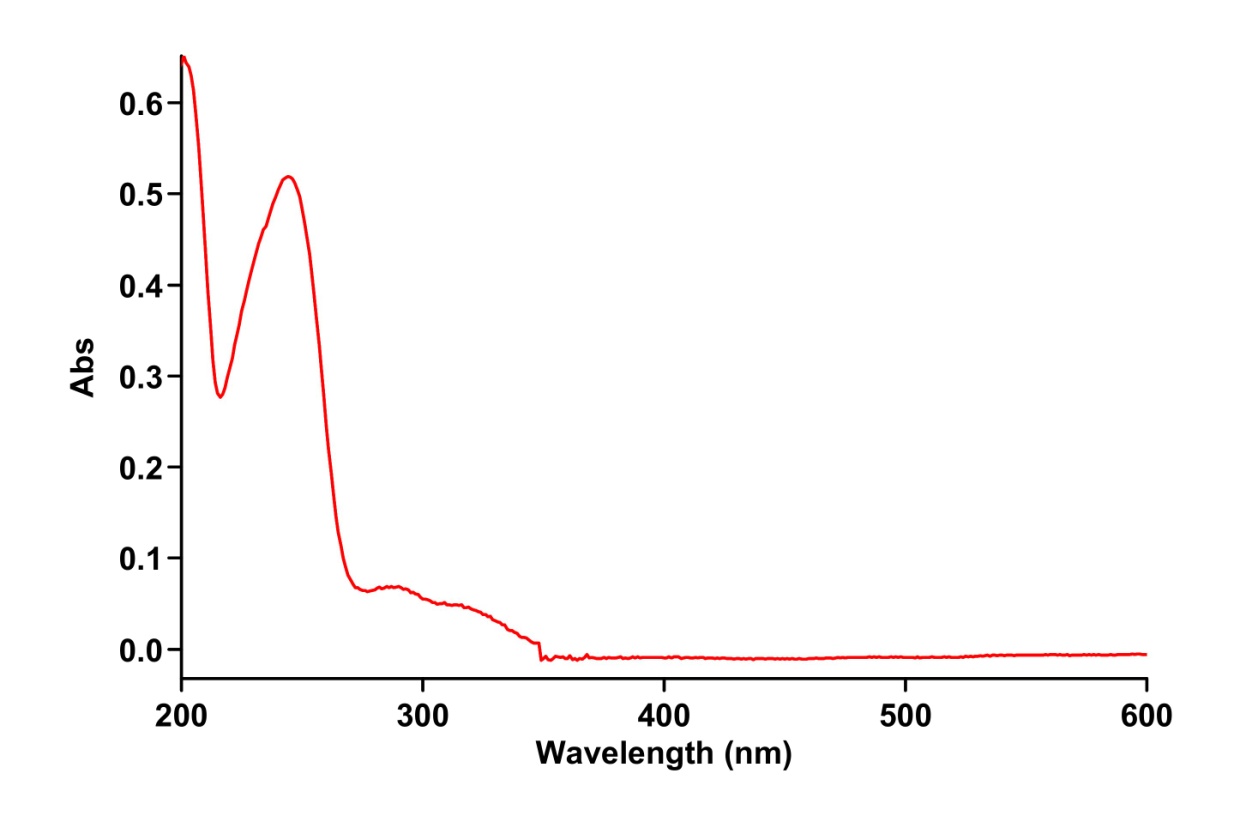
Supplemental Material File (SMF) of the article:

**Synthesis, kinetics and a full mechanistic investigation of four-component reaction for preparation of 2-amino-3-cyanopyridine derivatives in the presence of a green catalyst**

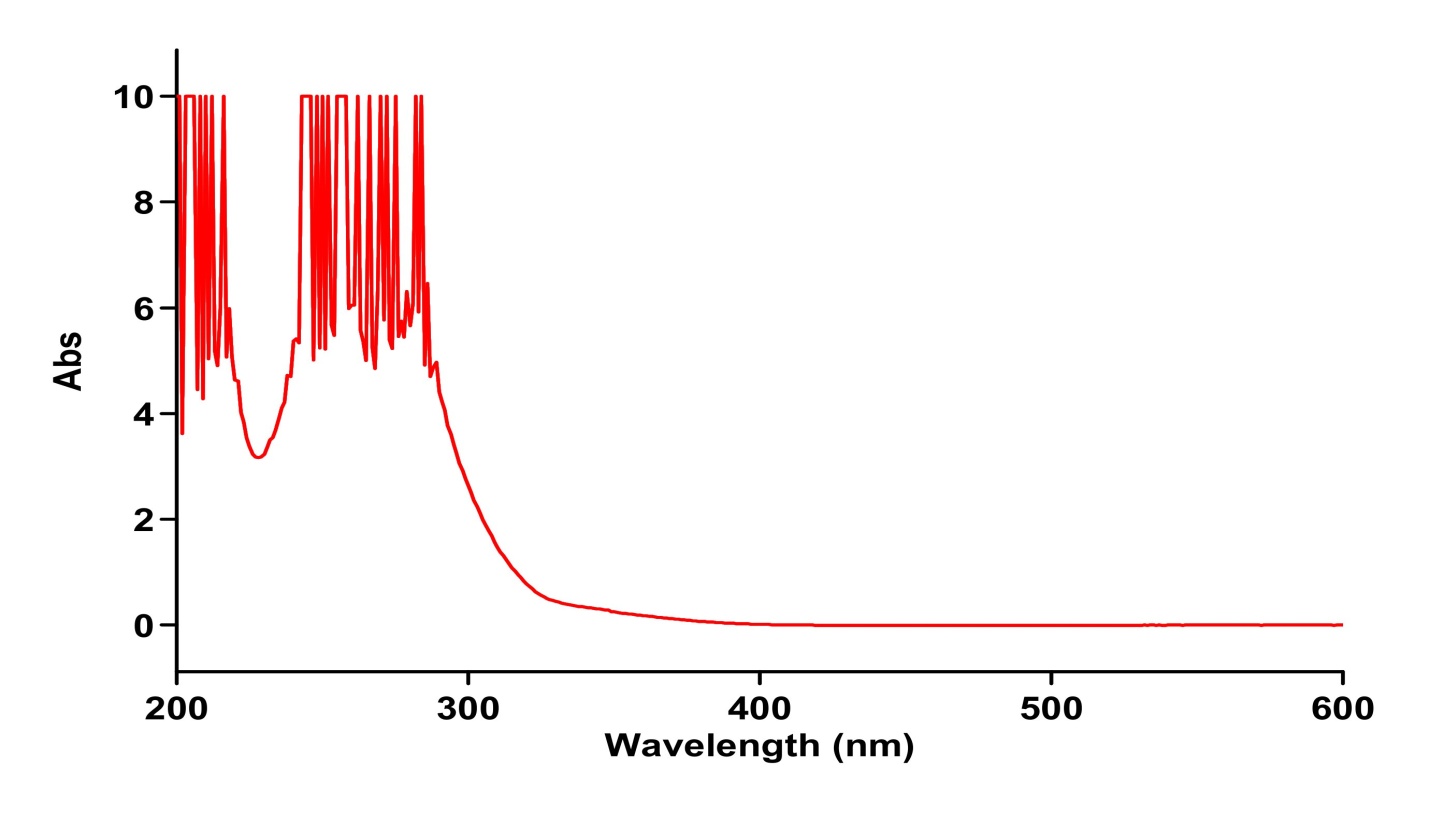
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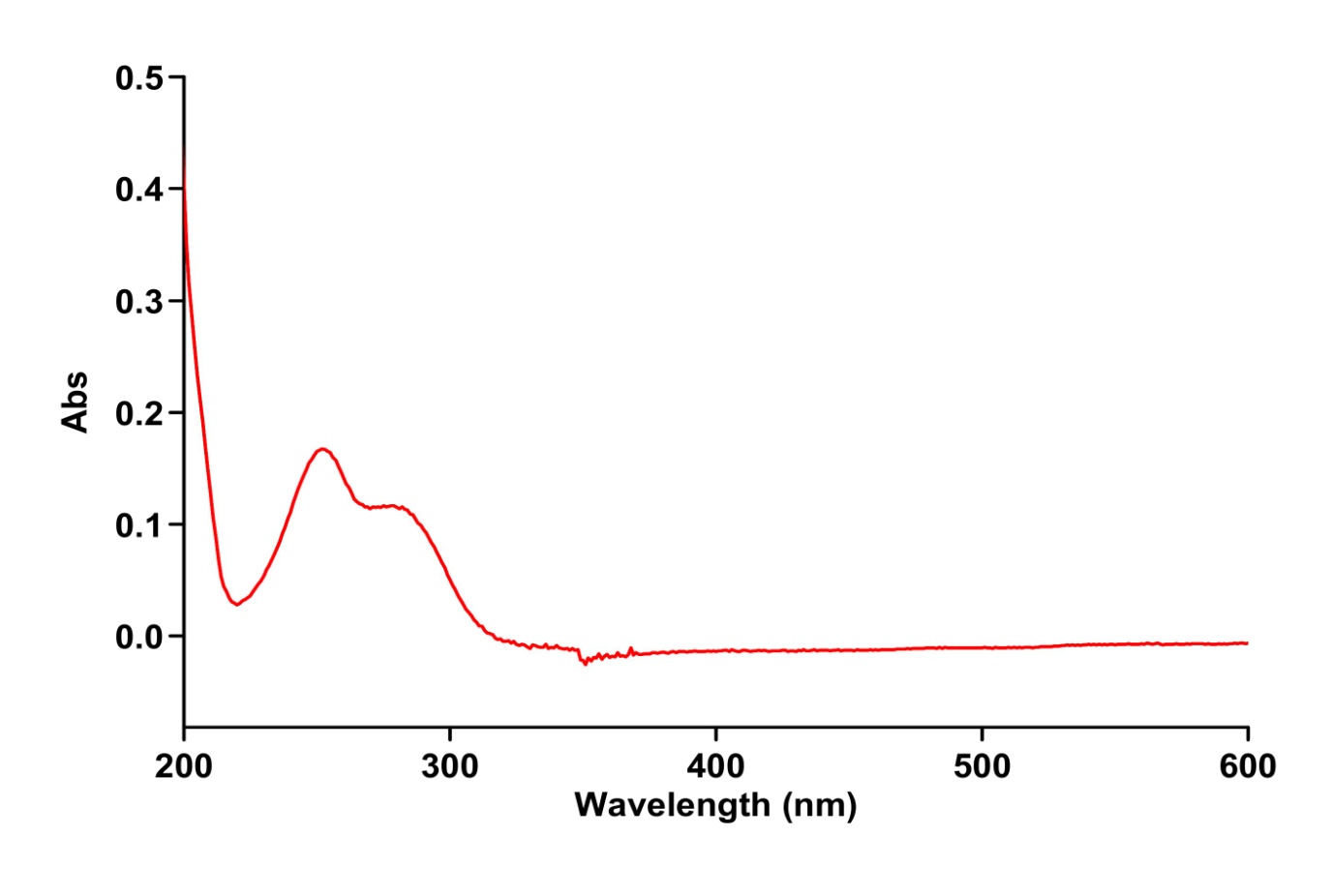
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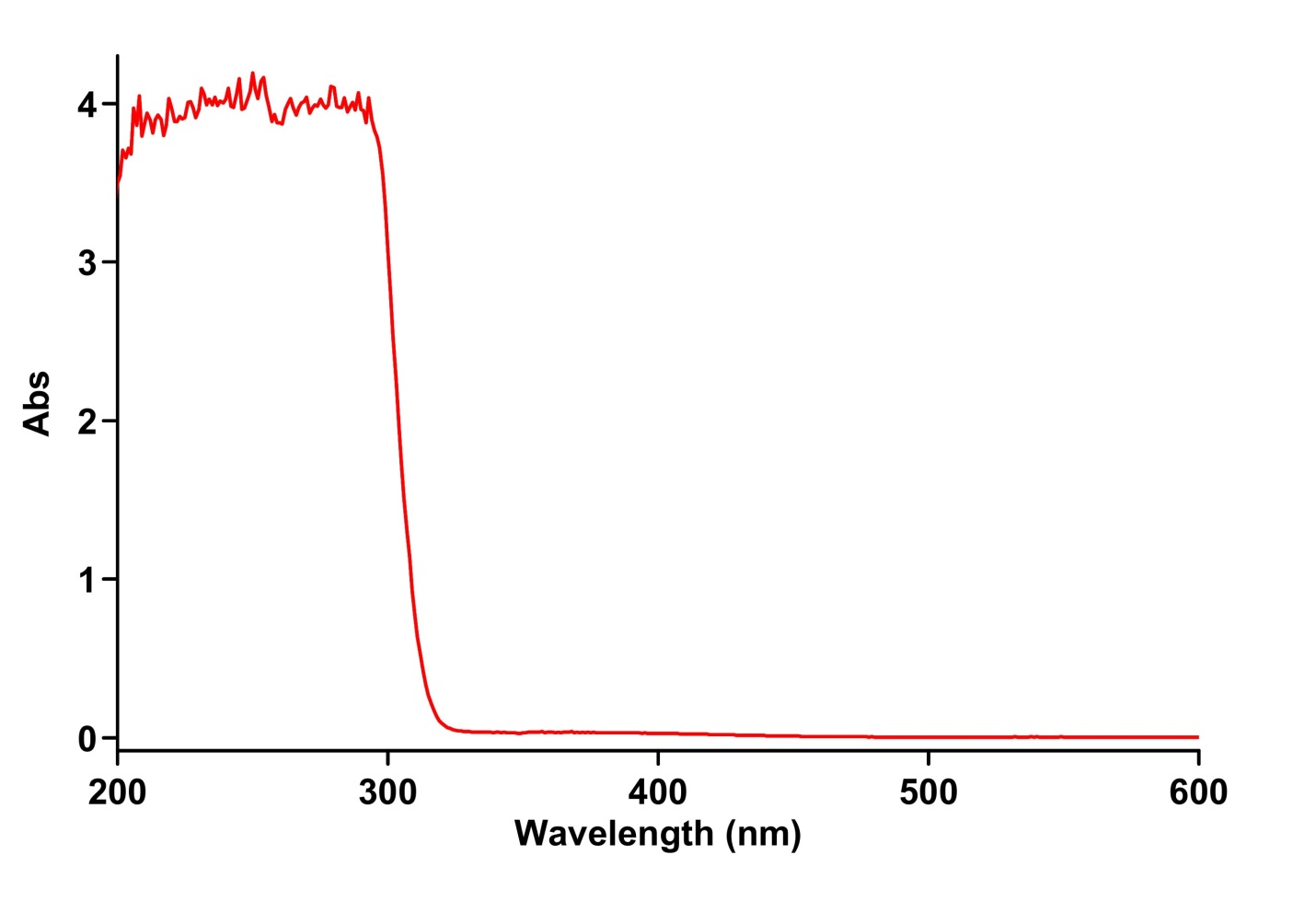
**Fig.S1 :** UV spectrm of 5×10-3 M mlaoonitrile (**2**) in a mixture of H2O/ Ethanol (50/50).



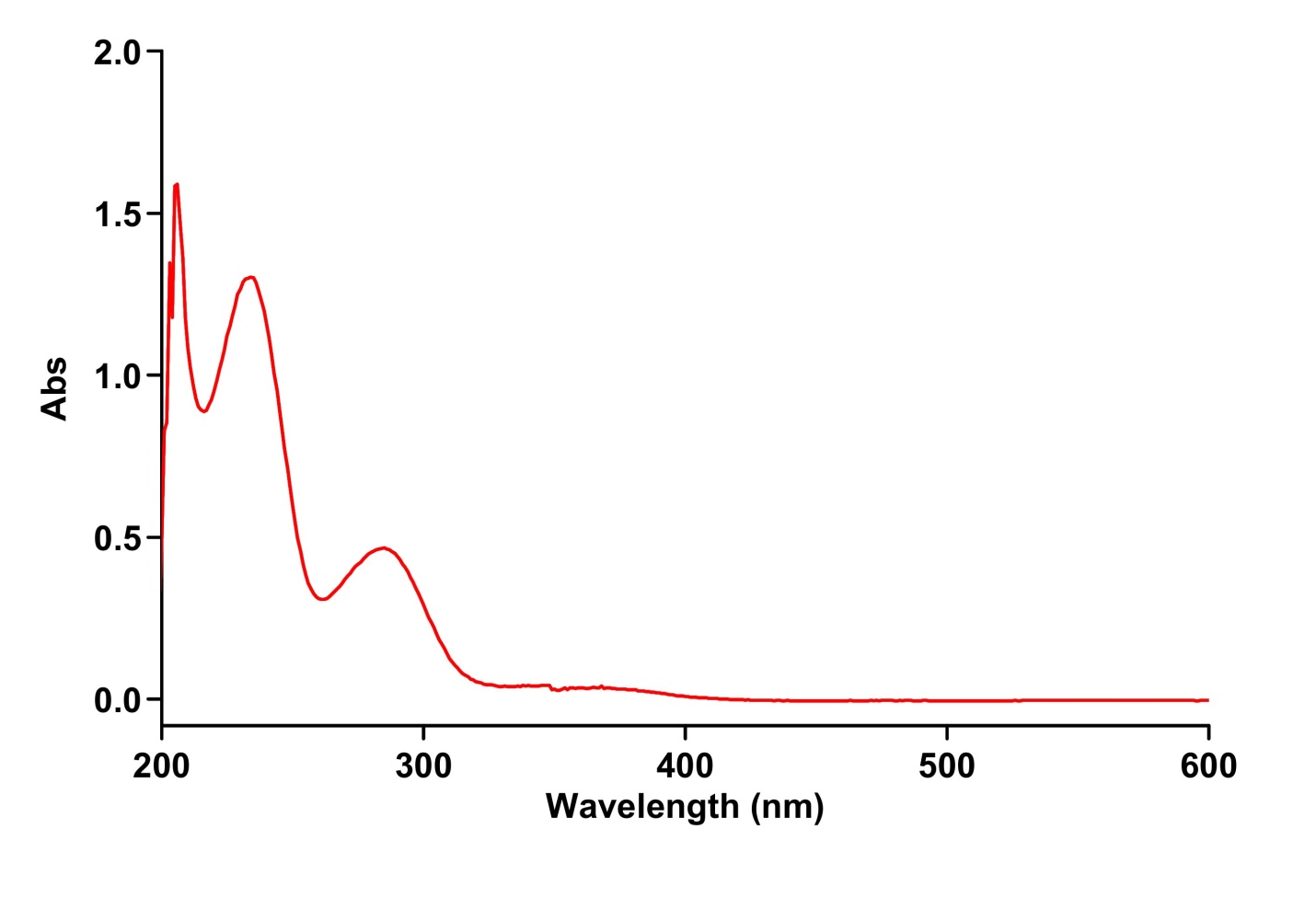
**Fig.S2 :** UV spectrm of 5×10-3 M 4-nitrobenzaldeyd (**2**) in a mixture of H2O/ Ethanol (50/50).



**Fig.S3 :** UV spectrm of 5×10-3 M cyclohexanone (**3**) in a mixture of H2O/ Ethanol (50/50).



**Fig.S4 :** UV spectrm of 5×10-3 M aniline (**4**) in a mixture of H2O/ Ethanol (50/50).

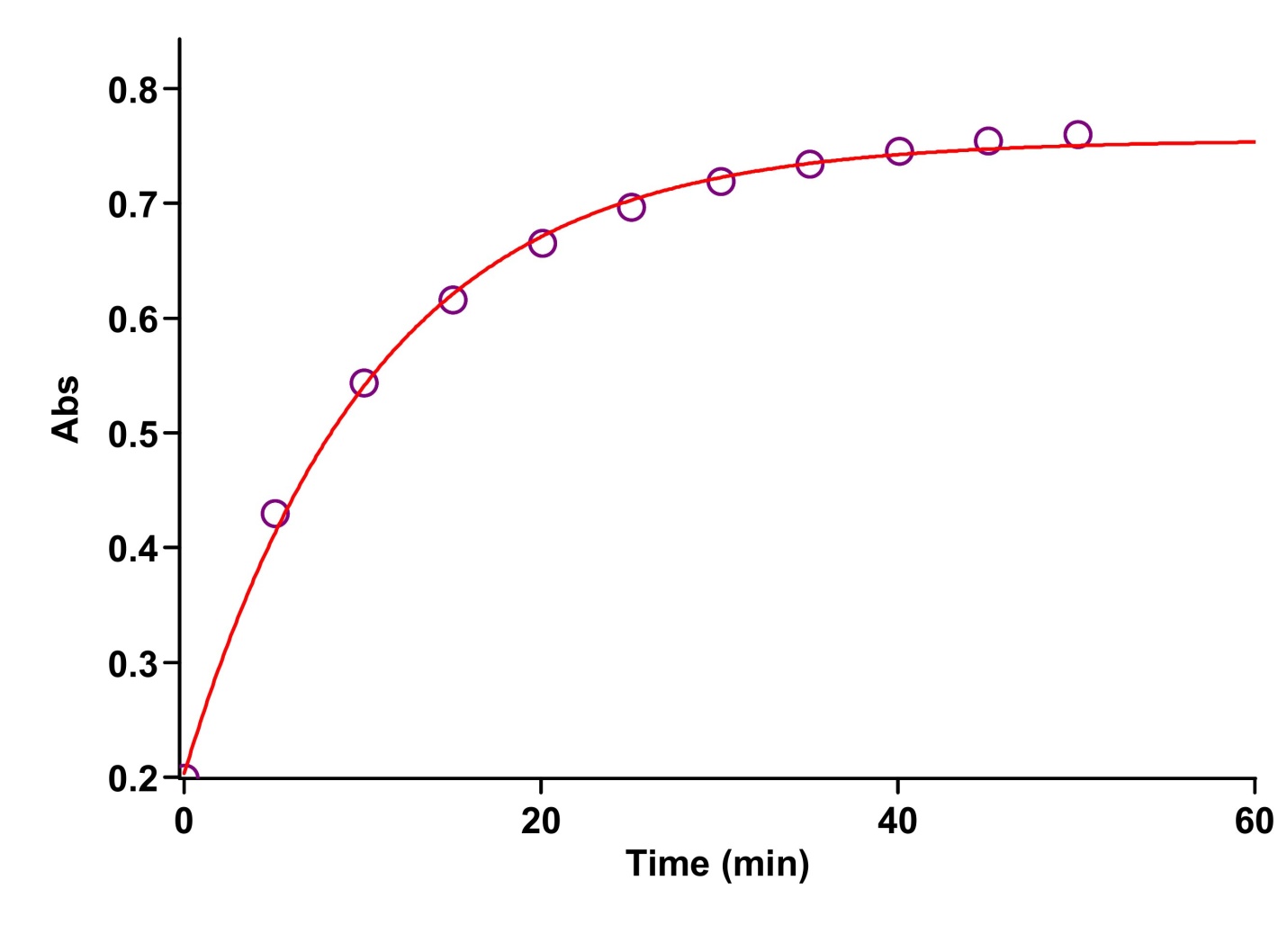


**Fig.S5 :** UV spectrm of 5×10-3 M maltose in a mixture of H2O/ Ethanol (50/50).

**Fig.S6.** UV spectra of the reaction progress between (**1**), (**2**), (**3**) and (**4**) the presence of maltose catalyst, the upward arrow indicates product increasing with the passage time.

**Fig.S7 :** Second- order fitting curve (solid line) on experimental absorbance curve for the product (**5**) formation versus time at 410 nm and 30 C under pseudo-order condition with respect to aniline [(4), 2.5×10-4 M]

**Fig.S8.** Second- order fitting curve (solid line) on experimental absorbance curve for the product (**5**) formation versus time at 410 nm and 30 C under pseudo-order condition with respect to cyohexanone[(**3**), 2.5×10-4 M]



**Fig.S9 :** First- order fitting curve (solid line) on experimental absorbance curve for the product (**5**) formation versus time at 410 nm and 30 C under pseudo-order condition with respect to 4-nitrobezaldehyde [(**2**), 2.5×10-4 M]

**Fig.S10 :** Dependence of ln k on reciprocal temperature in order to evaluate Ea/R from the slope according to the Arrhenius equation .

**Fig.S11 :** Dependence of ln k/T on reciprocal temperature in order to evaluate activation parameters (ΔH‡ and ΔS‡, respectively) from the slope and intercept according to the Eyring equation, for the reaction between 4-nitro benzaldehyde (**2**), malononitrile (**1**), cyclohexanone (**3**) and aniline (**4**) in the presence of maltose as a catalyst in a mixture of water and ethanol (50 : 50).

**Fig.S12 :** Dependence of ln k/T on reciprocal temperature in order to evaluate activation parameters (ΔH‡ and ΔS‡, respectively) from the slope and intercept according to the Eyring equation, for the reaction between 4-nitro benzaldehyde (**2**), malononitrile (**1**), cyclohexanone (**3**) and aniline (**4**) in the presence of maltose as a catalyst in a mixture of water and ethanol (20 : 80).

**Fig.S13 :** Dependence of ln k/T on reciprocal temperature in order to evaluate activation parameters (ΔH‡ and ΔS‡, respectively) from the slope and intercept according to the Eyring equation, for the reaction between 4-nitro benzaldehyde (**2**), malononitrile (**1**), cyclohexanone (**3**) and aniline (**4**) in the presence of maltose as a catalyst in a mixture of ethanol.

The procedur for deriving the various rate laws:

If the step 10 being the RDS, previous step (step 9) should be the reversible process, herein, the rate law can be written from the following simplied reaction mechanism:



If

If the step9 bing the RDS, previous step (step 8) should be revesiable process, hear the rate law can be written from the following simplied reaction mechanism:



If

If the step8 bing the RDS, previous step (step 7) should be revesiable process, hear the rate law can be written from the following simplied reaction mechanism:



If

If the step7 bing the RDS, previous step (step 6) should be revesiable process, hear the rate law can be written from the following simplied reaction mechanism:



I f

If the step6 bing the RDS, previous step (step 5) should be revesiable process, hear the rate law can be written from the following simplied reaction mechanism:



I f

If the step5 bing the RDS, previous step (step 4) should be revesiable process, hear the rate law can be written from the following simplied reaction mechanism:



I f

If the step4 bing the RDS, previous step (step 3) should be revesiable process, hear the rate law can be written from the following simplied reaction mechanism:



I f

If the step3 bing the RDS, previous step (step 2) should be revesiable process, hear the rate law can be written from the following simplied reaction mechanism:



I f

If the step2 bing the RDS, previous step (step 1) should be revesiable process, hear the rate law can be written from the following simplied reaction mechanism :



I f

If the step2 bing the RDS, previous step (step 1 should be revesiable process, hear the rate law can be written from the following simplied reaction mechanism:

