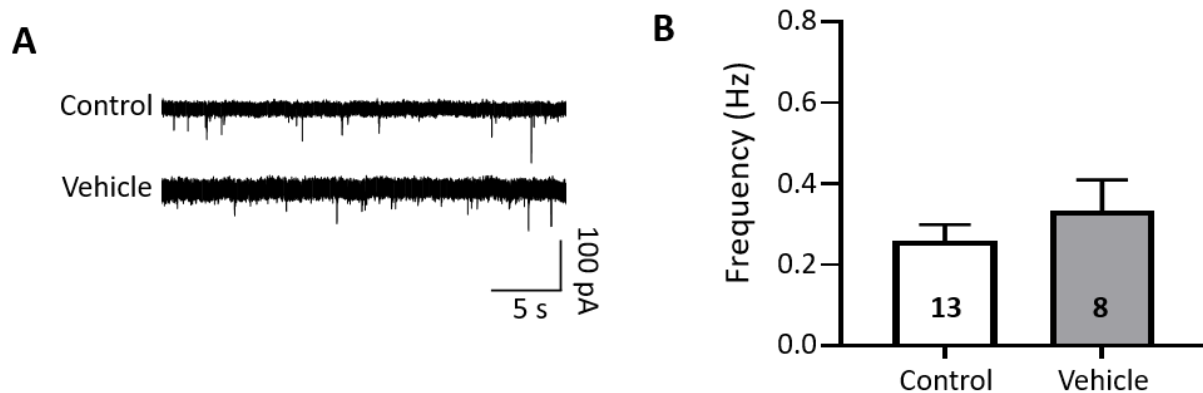
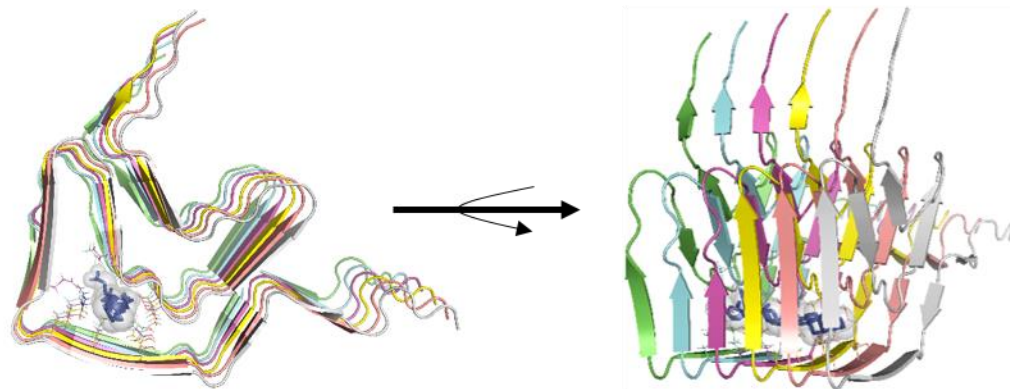


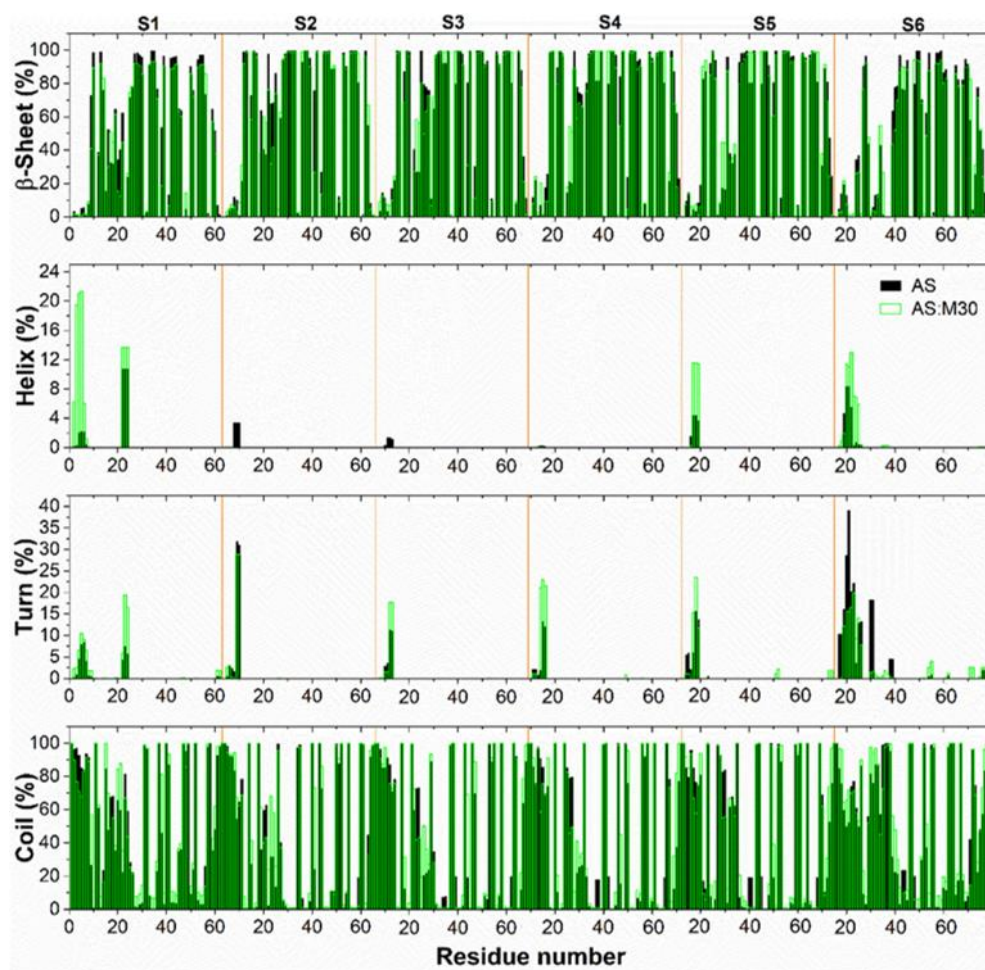
Supplementary Figure S1. Characterization of Aβ₁₋₄₀ aggregation kinetics. (A) ThT aggregation assay showing the rapid oligomerization of 32 μM Aβ₁₋₄₀ in the presence of 24 μM thioflavin T (ThT) at pH 7.4 in DPBS, at 37 °C, for 21 h. Amyloid formation was monitored by an increase in ThT fluorescence at 485 nm. Values are expressed as a percentage of the maximum ThT fluorescence. Graph represents the mean ± SEM (n = 3 independent experiments). **(B)** Electron micrograph demonstrating the rapid tendency of the peptide to aggregate and form amyloid fibrils after 21 hours in solution. Immunoreactivity was detected using an Au nanoparticle (10 nm) conjugated secondary antibody. Scale bar, 0.2 μm.



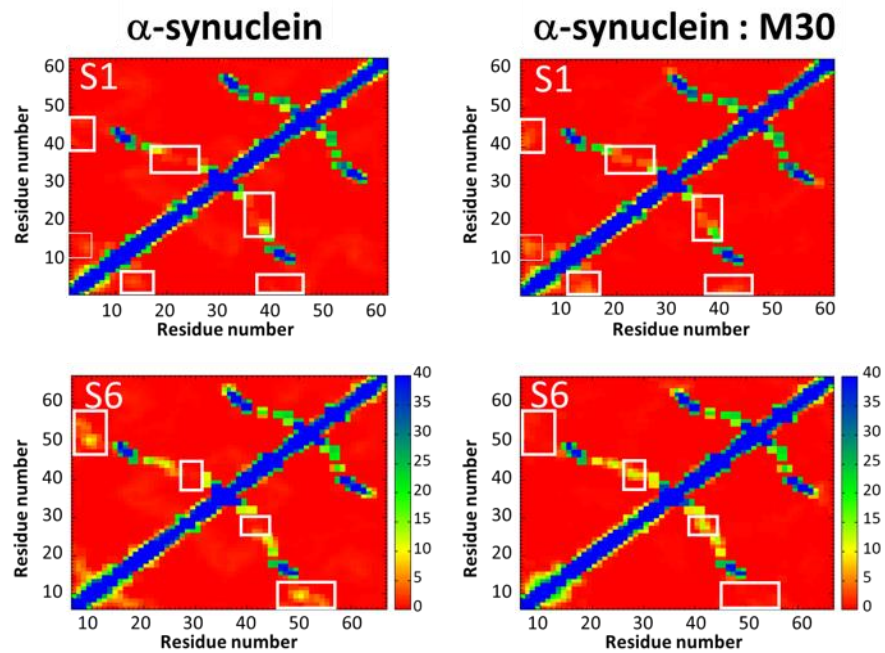
Supplementary Figure S2. Vehicle control for intracellular α SynO effects. (A, B) Representative miniature post-synaptic currents **(A)** and frequency quantification **(B)** for control and vehicle conditions. Control synaptic current recordings were made with an intracellular solution without α SynO, and the vehicle sample includes only the solvents used for the preparation of α SynO. Bars represent the mean \pm SEM from the indicated number of neurons. Unpaired Student's t-test. Control 13 y vehiculo 8.



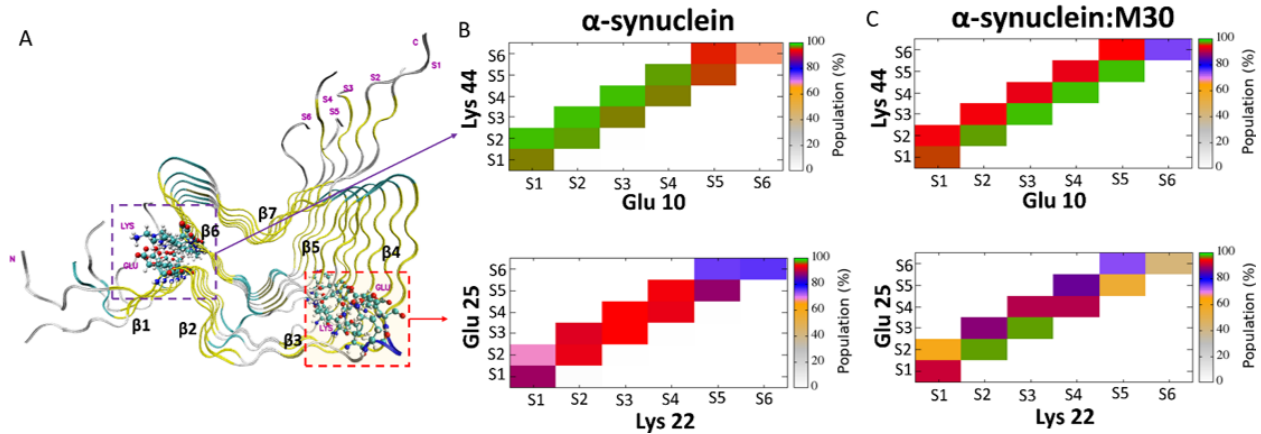
Supplementary Figure S3. Alternative position of M30 in the α Syn fibril predicted by protein-ligand docking. Each subunit is individually colored, and 4 predicted positions of M30 are shown inside the fiber with a binding site that varies mainly in the subunits that form it, conserving the amino acids involved.



Supplementary Figure S4. Shifts in the secondary structure elements induced by M30 in α Syn fibrils. The average secondary structure per residue was calculated by averaging all α Syn and α Syn:M30 conformations acquired between 200 and 500 ns of each trajectory. Subunits are labelled on the top of the diagram.



Supplementary Figure S5. Modifications of α Syn contact maps in the presence of M30. The intra-subunit residue contacts are displayed for α Syn and α Syn:M30 at subunit S1 and S6.



Supplementary Figure S6. Effects on salt bridge formation in α Syn by M30. (A) *In silico* simulations showing α Syn aggregates composed of six monomers. Each monomer possesses seven beta sheets forming short intra-peptide Lys22-Glu25 (segmented square in red) and long inter-peptide Glu10-Lys44 salt bridges (segmented square in purple). **(B)** Contact maps for α Syn showing intra-and inter-peptide salt bridges. **(C)** Variation of the same salt bridges in the presence of M30.