Table S1 Energy (in cm^{-1}) in the first rovibrational levels ($J \leq 6$, K=0,1,2 and symmetry A_1) for the O_2-O_2 dimer in the triplet electronic state, calculated using the *helicity decoupling* approximation. The rotational constants are also reported.

K	$J=0$	$J=1$	$J=2$	$J=3$	$J=4$	$J=5$	$J=6$	rotational constant
0	-106.0909	-96.39785	-105.6191	-95.63617	-104.5189	-94.26602	-102.7912	0.07761
	-84.88723	-82.34845	-84.43394	-81.60071	-83.37688	-80.25564	-81.71747	0.07520
	-77.72331	-76.23861	-77.27374	-75.48096	-76.22536	-74.11868	-74.57965	0.07521
	-76.22141	-73.12978	-75.78454	-72.38592	-74.76564	-71.04732	-73.16581	0.07451
	-71.50700	-63.55335	-71.05617	-62.83022	-70.00486	-61.52971	-68.35461	0.07396
1		-103.4078	-89.09196	-102.6233	-88.05023	-101.2122	-86.41521	0.07639
		-82.94458	-83.73310	-82.21349	-82.67817	-80.89845	-81.02141	0.07421
		-75.79890	-70.59769	-75.05621	-69.58593	-73.72029	-67.99722	0.07450
		-70.49581	-68.25356	-69.76697	-67.21145	-68.45626	-65.57559	0.07362
		-67.42497	-61.02357	-66.68484	-60.04378	-65.35351	-58.50611	0.07196
2			-102.8924	-86.40529	-101.7956	-85.01624	-100.0734	0.07793
			-86.50651	-79.25316	-85.43556	-77.91600	-83.75388	0.07574
			-80.10160	-68.10658	-79.04841	-66.77943	-77.39491	0.07471
			-72.41278	-61.52950	-71.38058	-60.21660	-69.76017	0.07344
			-65.33296	-56.36607	-64.30834	-55.05999	-62.69971	0.07296