

*Research article***Preparation and characterization of new silica-based heterofunctional biocatalysts utilizing low-cost lipase Eversa® Transform 2.0 and evaluation of their catalytic performance in isoamyl esters production from *Moringa oleifera* Lam oil****Wagner C. A. Carvalho¹, Rayane A. S. Freitas¹, Milson S. Barbosa³, Ariela V. Paula⁴, Ernandes B. Pereira⁵, Adriano A. Mendes⁶, Elton Franceschi^{1,2} and Cleide M. F. Soares^{1,2,*}**¹ Tiradentes University, Av. Murilo Dantas 300, Farolândia, 49032-490, Aracaju, SE, Brazil² Federal Institute of Education, Science and Technology of Paraíba (IFPB), 58900-000, Cajazeiras, PB, Brazil³ Faculty of Pharmaceutical Sciences, São Paulo State University (UNESP), 14800-903, Araraquara, SP, Brazil⁴ Federal University of Alfenas, Faculty of Pharmaceutical Sciences, 37130-001, Alfenas, MG, Brazil⁵ Federal University of Alfenas, Faculty of Chemistry, 37130-001, Alfenas, MG, Brazil⁶ Institute of Technology and Research, Av. Murilo Dantas 300, ITP building, Farolândia, 49032-490, Aracaju, SE, Brazil*** Correspondence:** Email: cleide18@yahoo.com.br; Tel: +55-79-32182190; Fax: +55-79-32182190.

Supplementary

Table S1. ANOVA for immobilization yields for ET2.0 lipase by multipoint covalent attachment for evaporation in an oven.

Source of variation	SS	df	MS	F	P-value	F crit
Treatments	875.200563	2	437.6002815	106.0855835	1.09394×10^{-10}	3.554557
Columns	1288.656563	2	644.3282815	156.2017773	4.22717×10^{-12}	3.554557
Between groups	791.3271481	4	197.831787	47.95952253	2.3206×10^{-9}	2.927744
Within groups	74.24953333	18	4.124974074			
Total	3029.433807	26				

Table S2. ANOVA for immobilization yields for ET2.0 lipase by multipoint covalent attachment for evaporation in a desiccator.

Source or variation	SS	df	MS	F	P-value	F crit
Treatments	116.8970963	2	58.44854815	27.232	36×10^{-6}	3.554557
Columns	1167.204941	2	583.6024704	271.9086	3.56×10^{-14}	3.554557
Between groups	974.4292815	4	243.6073204	113.5001	1.65×10^{-12}	2.927744
Within groups	38.63373333	18	2.146318519			
Total	2297.165052	26				

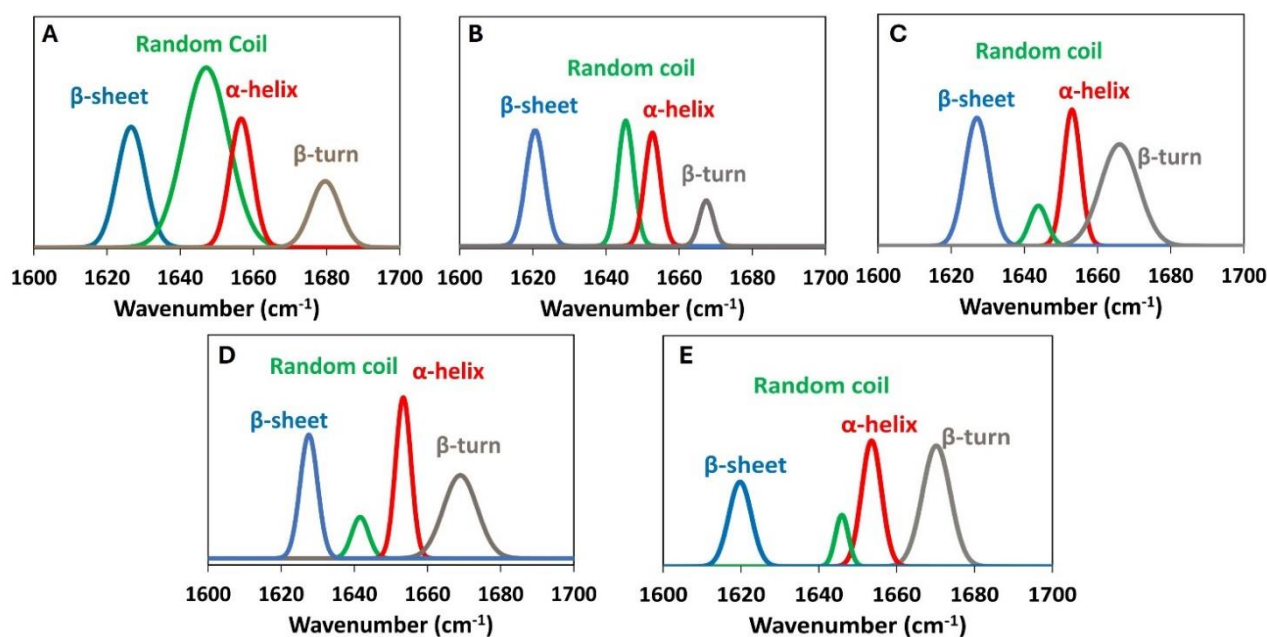


Figure S1. Profile of secondary structure of ET2.0 lipase: (A) free, (B) AmG-6h, (C) AmG-70h, (D) Gly, and (E) Epx.



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