

paintistanbul TURKCOAT CONGRESS

DEVELOPMENT OF VEGETABLE OIL ACID CONTAINING AIR DRYING WATER BASED EPOXY ESTER COATING PRODUCTS

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LITERATURE REVIEW

What are epoxy esters?

- Modified Epoxy Resins
- Reaction Products of epoxy resins and fatty acids
- Combine properties of both epoxy and alkyd resins

Types of Epoxy Esters:

-Short oil epoxy esters

Fast drying, good hardness

-Medium oil epoxy esters

Balance the flexibility and drying time

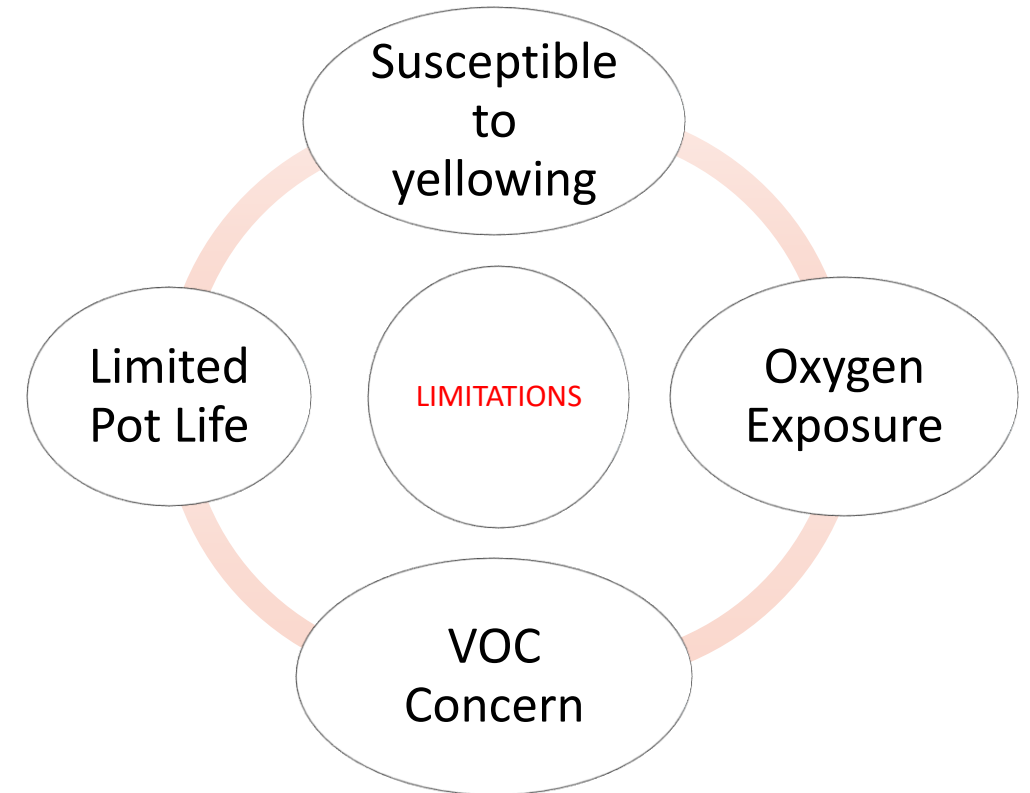
-Long oil epoxy esters

Better flexibility and outdoor durability

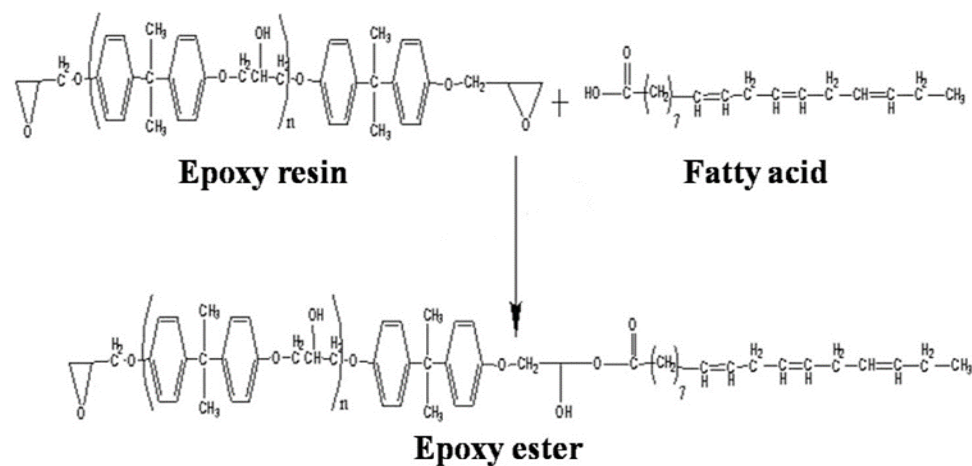


LITERATURE REVIEW

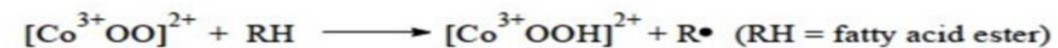
Feature	Epoxy Esters	Traditional Alkyds
Drying Time	Faster	Slower
Adhesion	Excellent	Moderate
Chemical Resistance	Higher	Lower
Durability	Superior	Moderate



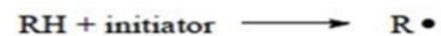
LITERATURE REVIEW



Oxygen absorption



Hydrogen abstraction



Direct activation of the double bond



Formation of hydroperoxides



Decomposition of hydroperoxides



LITERATURE REVIEW

Maintenance Coatings:

- Protect surfaces subjected to wear and environmental damage.
- Offer the ability to withstand extreme conditions, such as temperature fluctuations and chemical exposure.
- Ensure long-lasting protection for various surfaces, including concrete and metal



Primer for Metal Substrates:

- Enhance the bonding strength between the metal surface and subsequent coatings
- Ensure longevity and durability of the finish.
- Is vital in industries such as automotive and construction, where metal surfaces are prevalent.

Marine Paints:

- Form a tough, durable layer that protects vessels from harsh marine environments, including saltwater and sun exposure.
- Enhances adhesion to fiberglass and metal surfaces, reducing the risk of peeling and deterioration.
- Is crucial for maintaining the integrity and appearance of ships and boats.



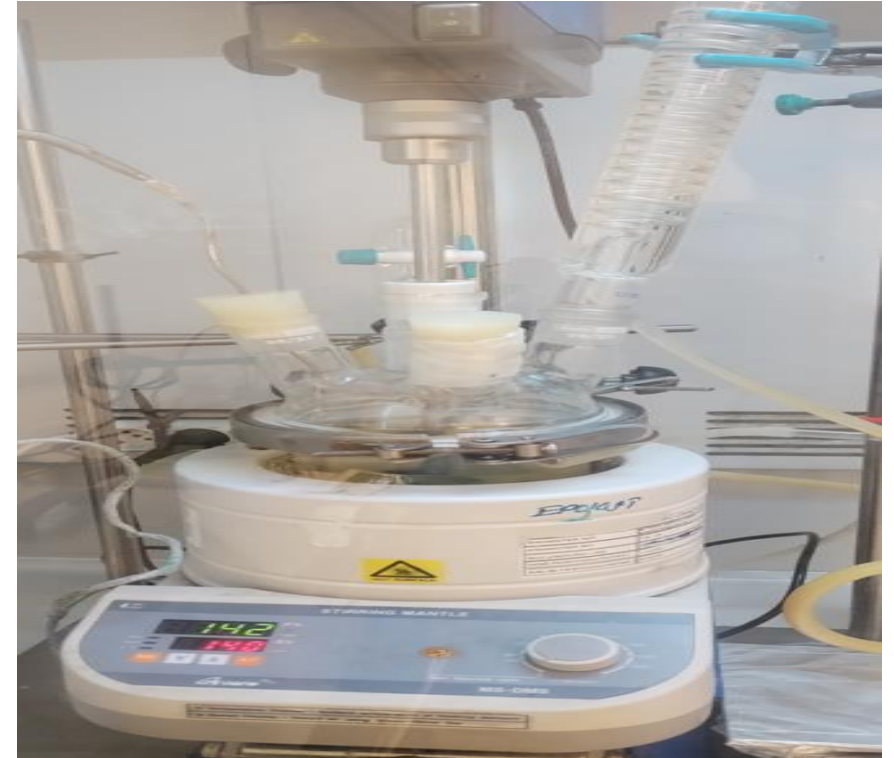
Wood Finishes:

- Create a hard, resilient surface that enhances the natural beauty of wood.
- Provide excellent resistance to scratches, stains, and moisture.
- Protect the wood and also allow for ease of cleaning and maintenance.

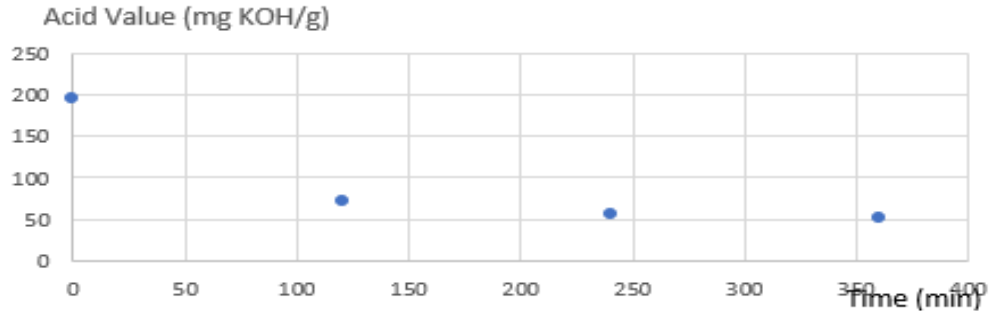
EXPERIMENTAL

Epoxy Fatty Acid Esters

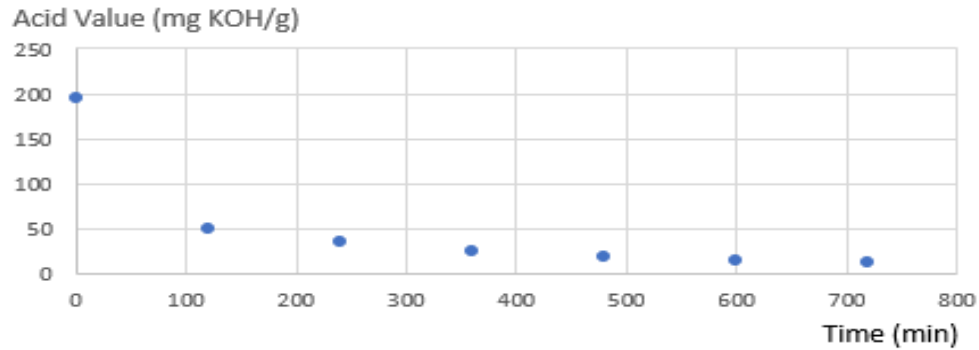
- Good adhesion to metal, wood and concrete, etc...
- Chemical and corrosion resistance
- Fast Drying (oxidative)
- Excellent gloss and weather resistance
- Enhanced flexibility



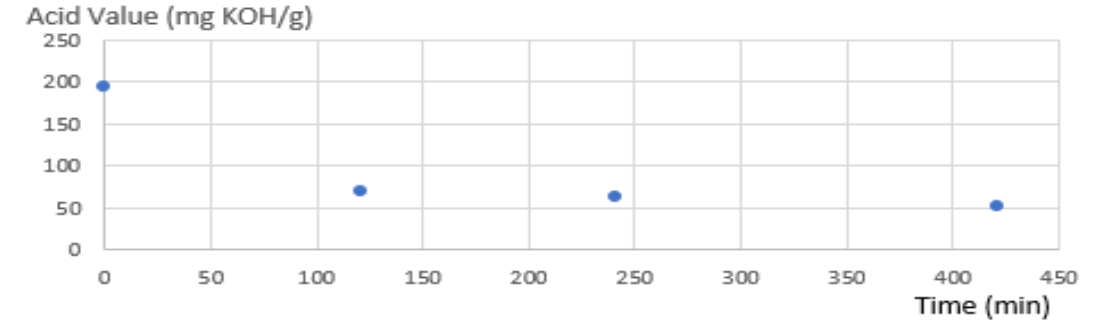
EXPERIMENTAL



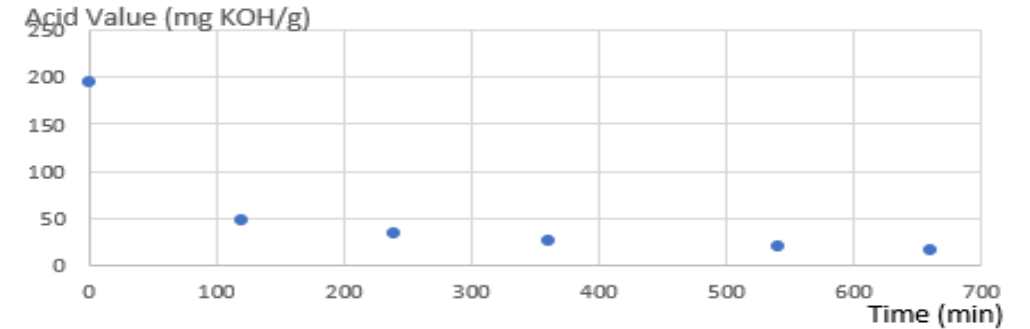
Synthesis – 1 (ER:FA=0,85:1 ; 140 C ; 0, Cat: 0, 5%)



Synthesis – 3 (ER:FA=1:1 ; 160 C ; Cat: 0, 50%)

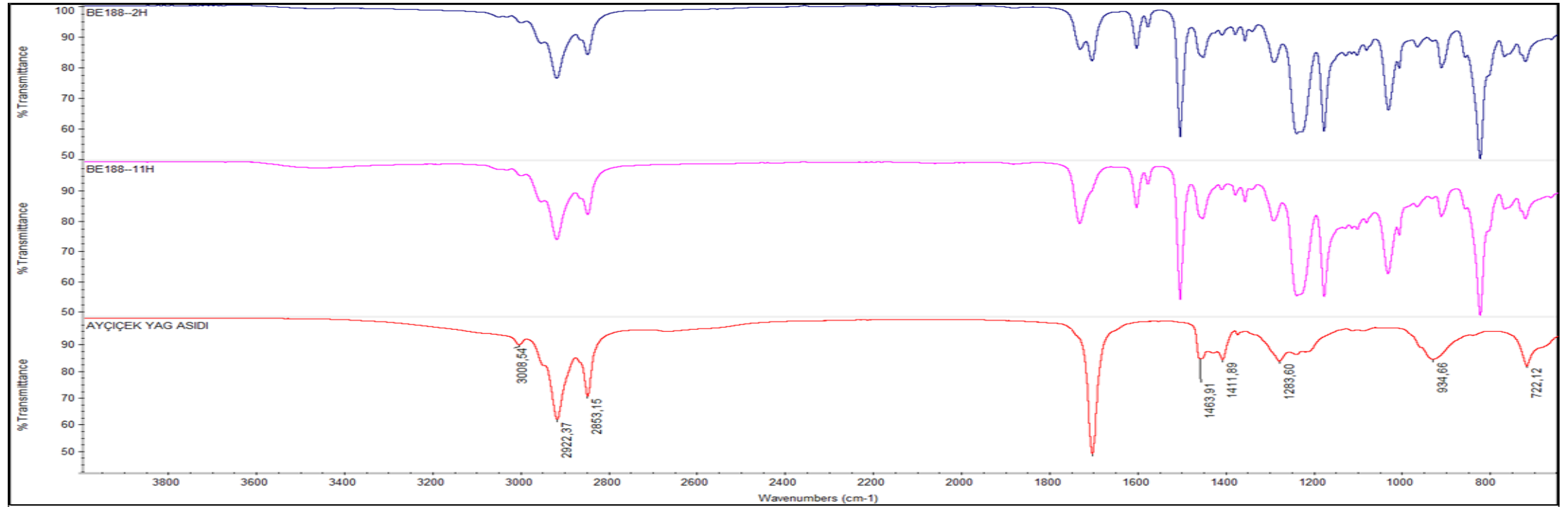


Synthesis – 2 (ER:FA=0,85:1 ; 140 C ; Cat: 0, 75%)

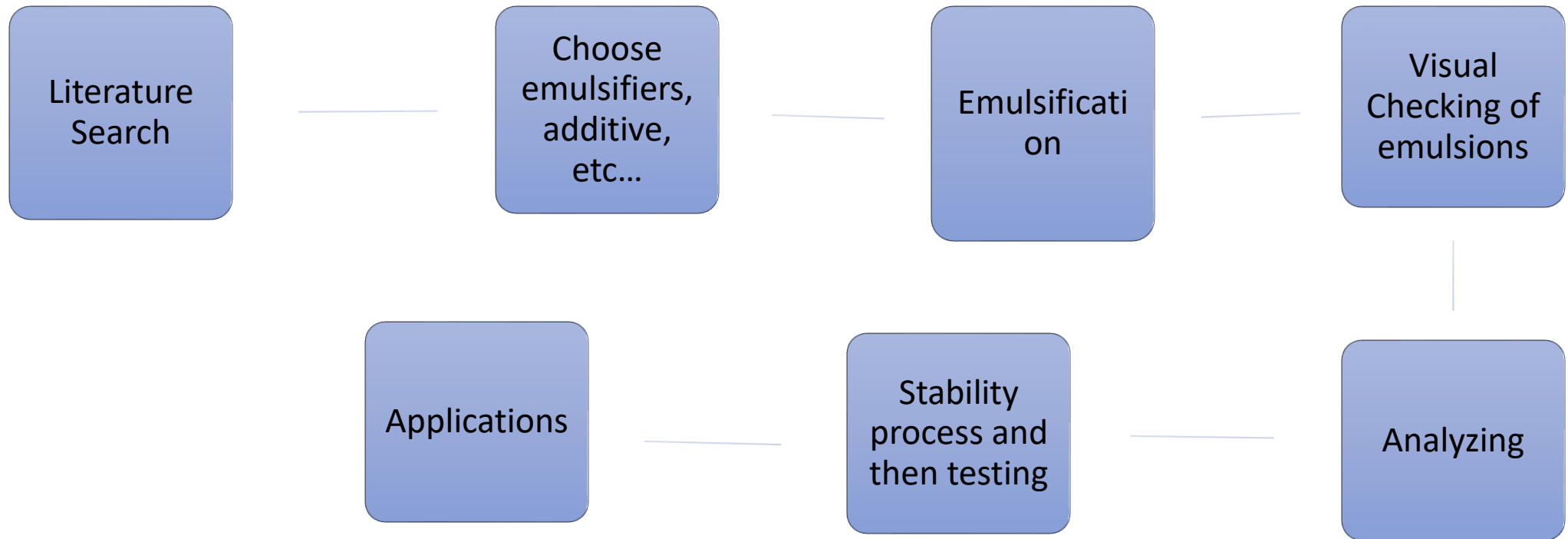


Synthesis – 4 (ER:FA=1,14:1 ; 160 C ; Cat: 0, 50%)

EXPERIMENTAL



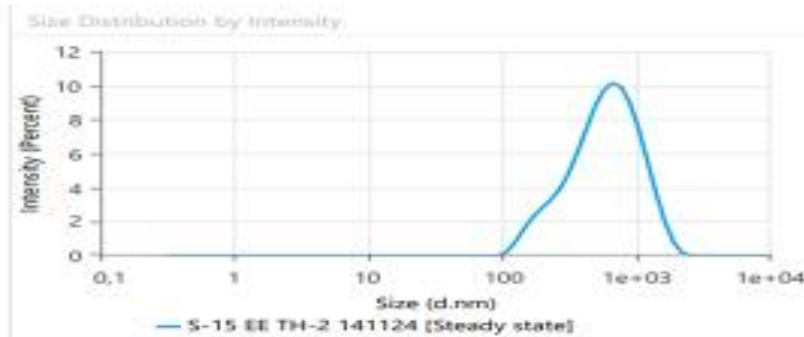
EXPERIMENTAL



EXPERIMENTAL

	FORMULATION CODES						
Raw materials	F-1	F-2	F-3	F-4	F-5	F-6	F-7
Resin	22,51	17,54	21,72	21,95	22,63	11,72	11,328
Emulsifier 1	0,5	0,5	0,35	0,37	0,53	0,18	0,18
Emulsifier 2	2,05	2,01	1,54	1,54	2,05	0,84	0,72
dH2O	32,5	27,52	32,5	32,5	32,5	16,27	16,25
Others	0	0	0,0065	0,0325	0,0325	0,081	0,1068
VOC	0	0	0	0	0	0	0
Status(Fresh sample)	SEDİMENTED	STABLE	SEDİMENTED	SEDİMENTED	STABLE	STABLE	STABLE
Z-Avarage (nm) Fresh Sample	Not analyzed	654,2	Not analyzed	2475	496.5	856,3	1051
PDI Fresh sample	Not analyzed	0,2106	Not analyzed	0,7051	0,2729	0,2835	0,2568
Z-avarage (nm) (30D; 50 C)	Not analyzed	2880	Not analyzed	Not analyzed	709,5	1112	830,8
PDI (30D; 50 C)	Not analyzed	0,8853	Not analyzed	Not analyzed	0,10	0,41	0,3066

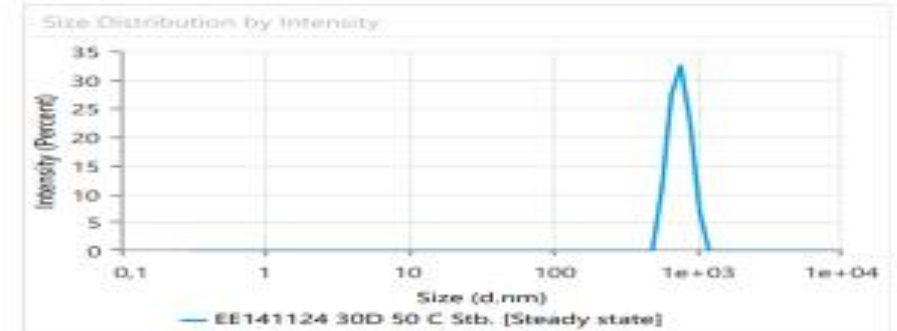
EXPERIMENTAL



Statistics Table

Name	Mean	Standard Deviation	RSD	Minimum	Maximum
Z-Average (nm)	496,5	-	-	496,5	496,5
Polydispersity Index (PI)	0,2729	-	-	0,2729	0,2729
Mean Count Rate (kcps)	466,4	-	-	466,4	466,4
Peak 1 Mean by Intensity ordered by area (nm)	664,7	-	-	664,7	664,7
Intercept	0,9612	-	-	0,9612	0,9612
Fit Error	0,001818	-	-	0,001818	0,001818

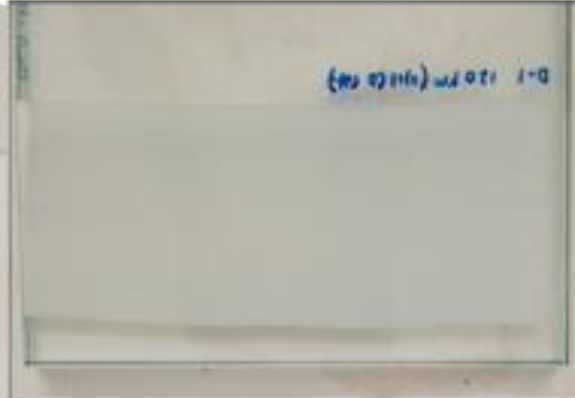
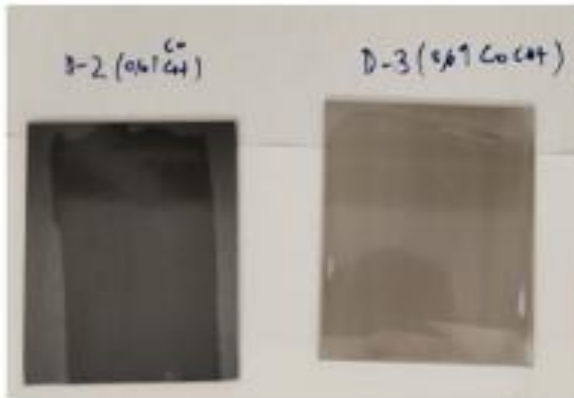
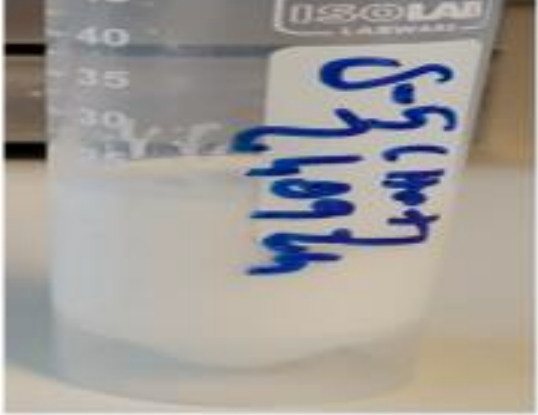
After 30D
aging at 50 °C



Statistics Table

Name	Mean	Standard Deviation	RSD	Minimum	Maximum
Z-Average (nm)	709,5	-	-	709,5	709,5
Polydispersity Index (PI)	0,1014	-	-	0,1014	0,1014
Mean Count Rate (kcps)	387,1	-	-	387,1	387,1
Peak 1 Mean by Intensity ordered by area (nm)	764,2	-	-	764,2	764,2
Intercept	0,8233	-	-	0,8233	0,8233
Fit Error	0,008319	-	-	0,008319	0,008319

EXPERIMENTAL



CONCLUSION

- Stable epoxy ester resins were synthesized from sunflower oil fatty acids and diglycidyl ether bisphenol A epoxy resin.
- Stable epoxy ester emulsions containing zero VOC were formulated and applied on different types of substrate including metal, glass, etc.
- Applied coating films showed good mechanical and chemical behaviors.

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THANK YOU...