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SYNTHESIS & CHARACTERIZATION OF BIOFRIENDLY PRESSURE SENSITIVE ADHESIVES

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INTRODUCTION

Pressure sensitive adhesives (PSAs) are components of many systems: from medical procedures to sticky notes. This project aims to utilize biofriendly materials - **cyclodextrin (CD)**, a sugar derivative), **lipoic acid (LA)**, a dietary supplement), and **succinic acid (SA)**, a food additive) - to synthesize PSAs and study their composition, adhesion, and thermal properties in air as well as under water.

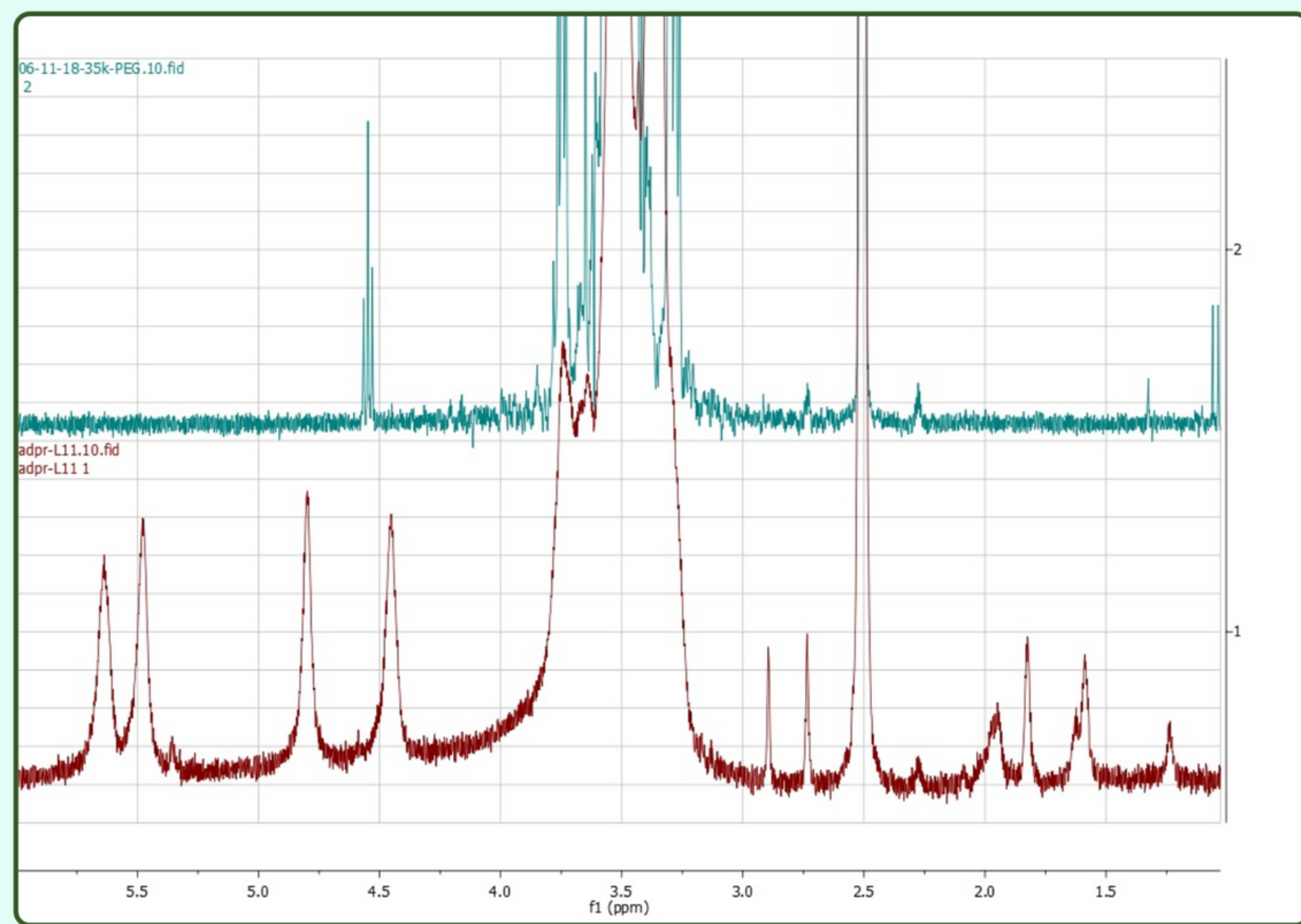
OBJECTIVE

Polyrotaxane (PR) is a molecular necklace made of CD rings threaded on a linear polymer (PEG). We aim to graft LA/SA onto CDs in PR to synergize unique stress relaxation of PR and the resultant adhesive properties.

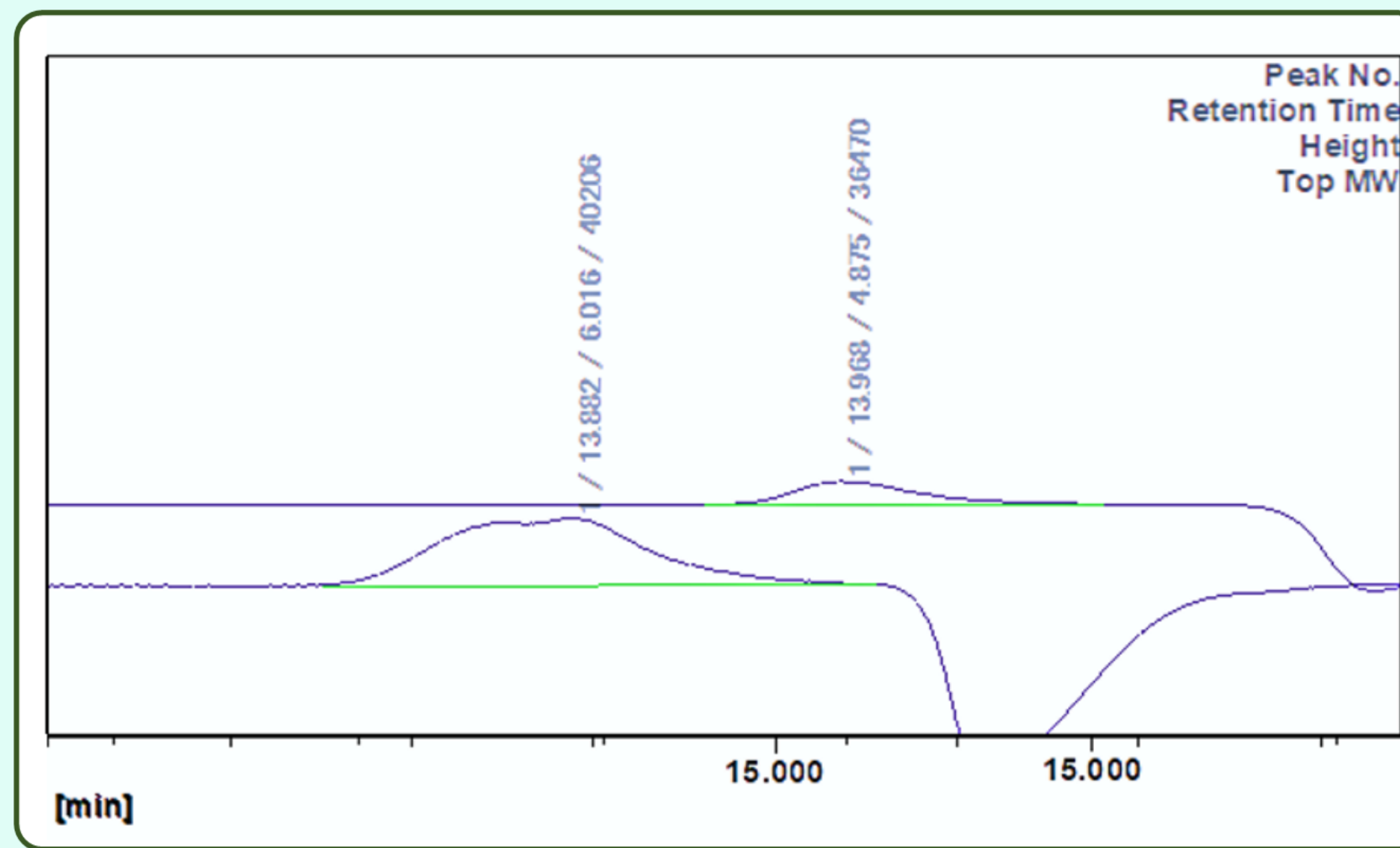
RESULTS

LOW INCLUSION BREAKTHROUGH

WE OBTAINED A "MOLECULAR NECKLACE" WITH BETTER SLIDING BEADS.



NMR comparing PR and PEG

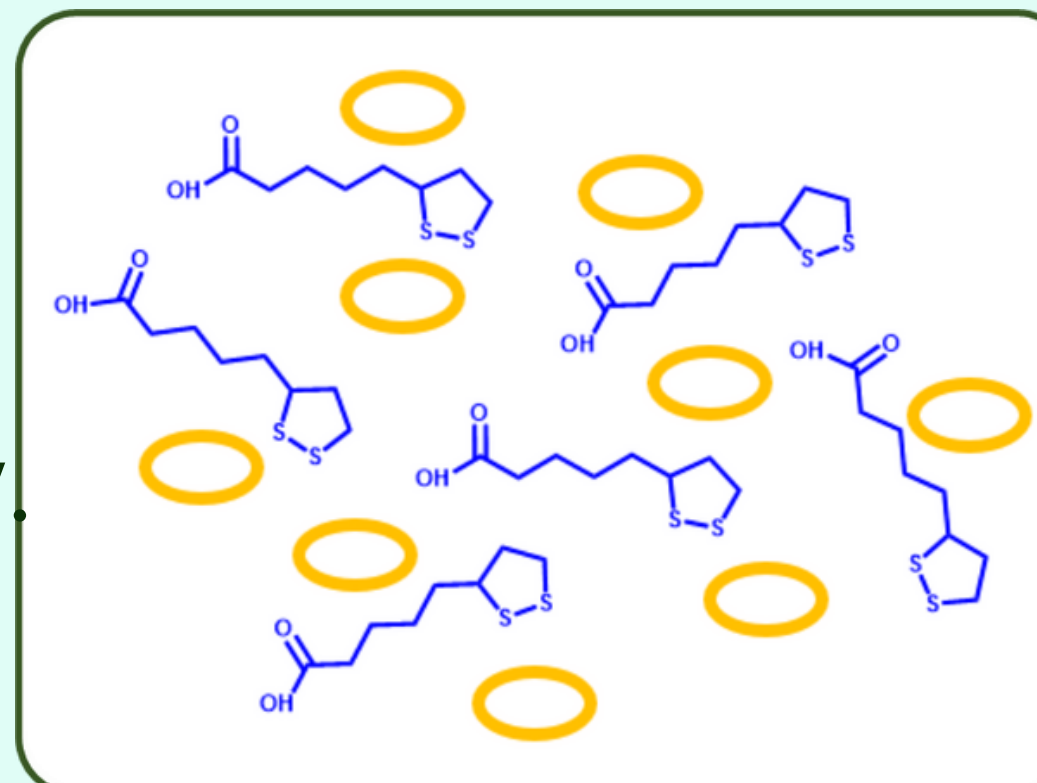


GPC comparing PR and PEG

LA:CD ADHESIVES



Adhesives of LA:CD compositions of varying ratios: 1:1, 4:1, 9:1, 99:1, and LA only. All samples besides pure LA have adhesive properties.



LA:CD

CONCLUSION

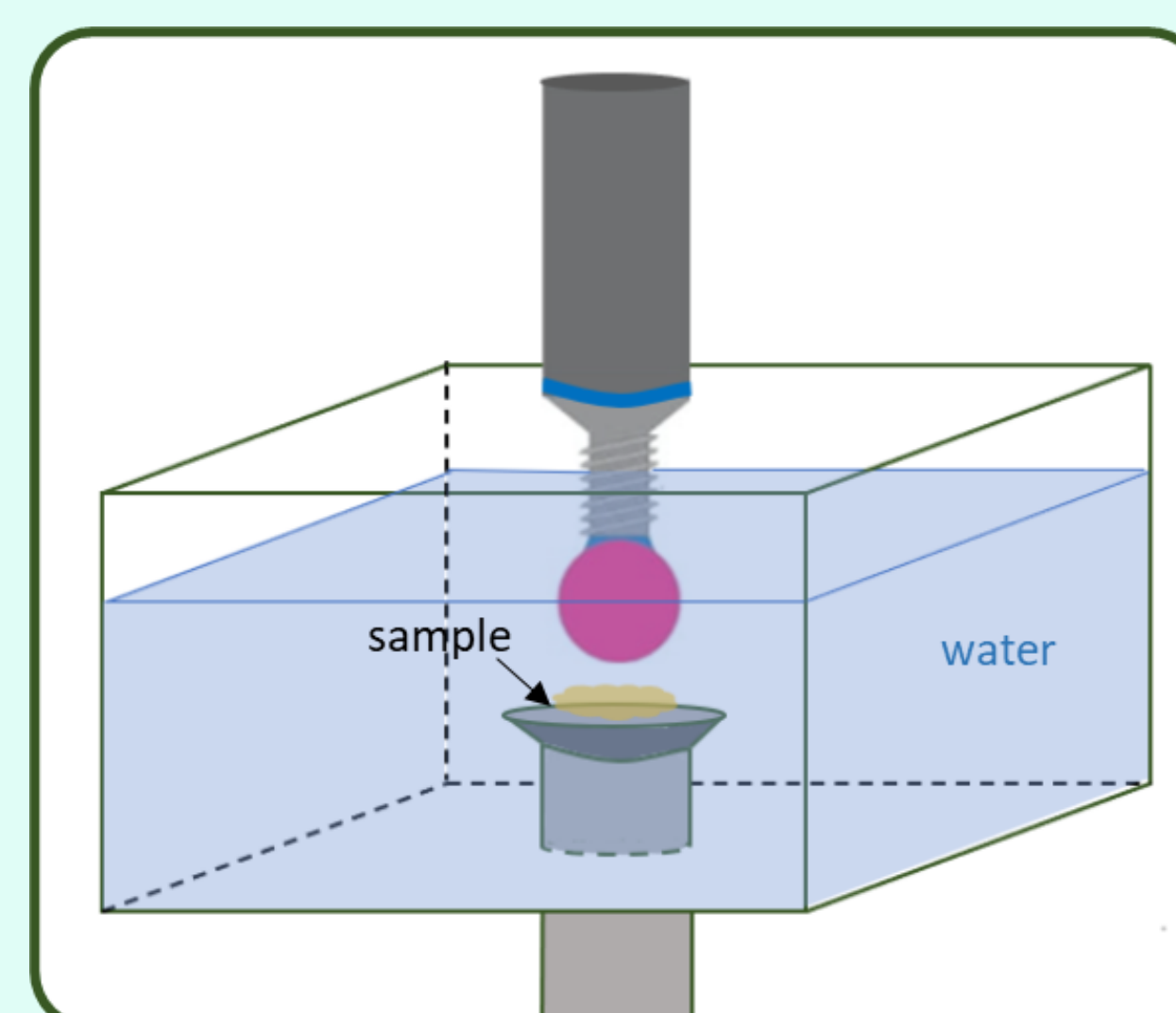
So far, it can be concluded that while pure LA does not give the desired adhesive properties, lipoated CD and PR show promising performance to be useful, biofriendly adhesives

DISCUSSION

- Morphological changes in LA:CD adhesive samples show signs of aging due to exposure to air
- Uncertainty in whether enhanced adhesive performance of lipoated CD and PR is due to functionalization of CD or synergy between CD and LA.

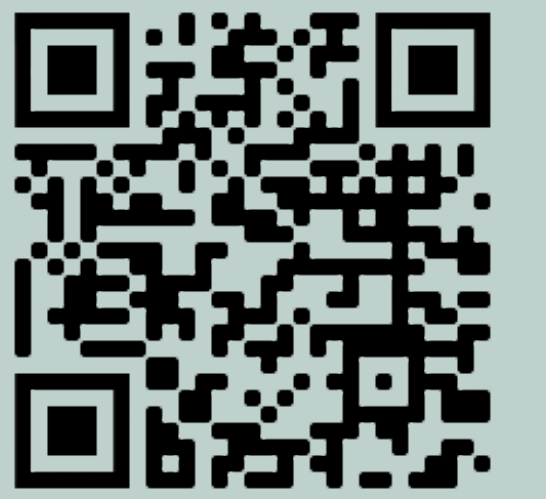
FUTURE GOALS

- Creation of SAPR and SADC adhesives
- Probe tack testing (under water)
- LA:CD composition characterization



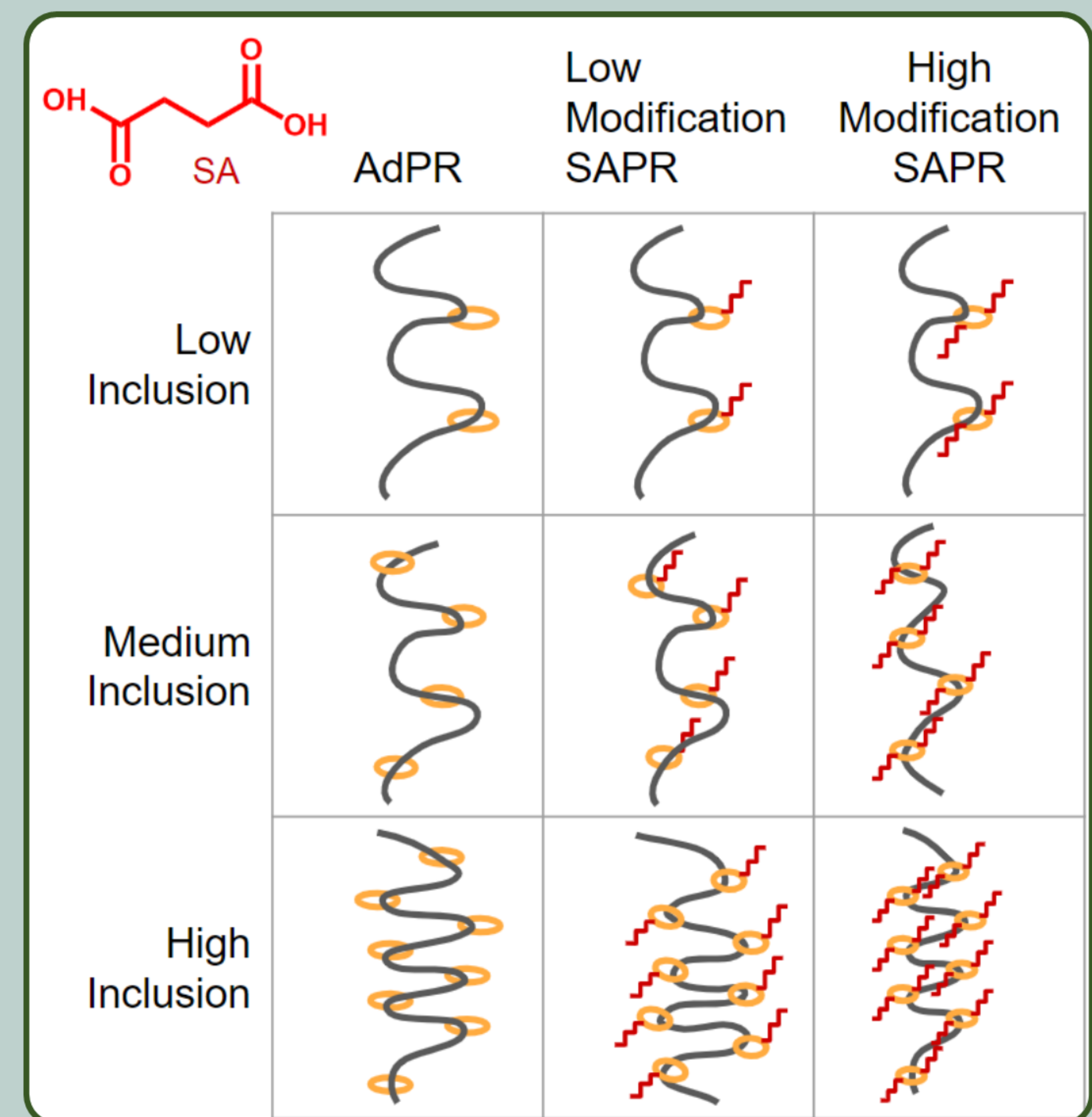
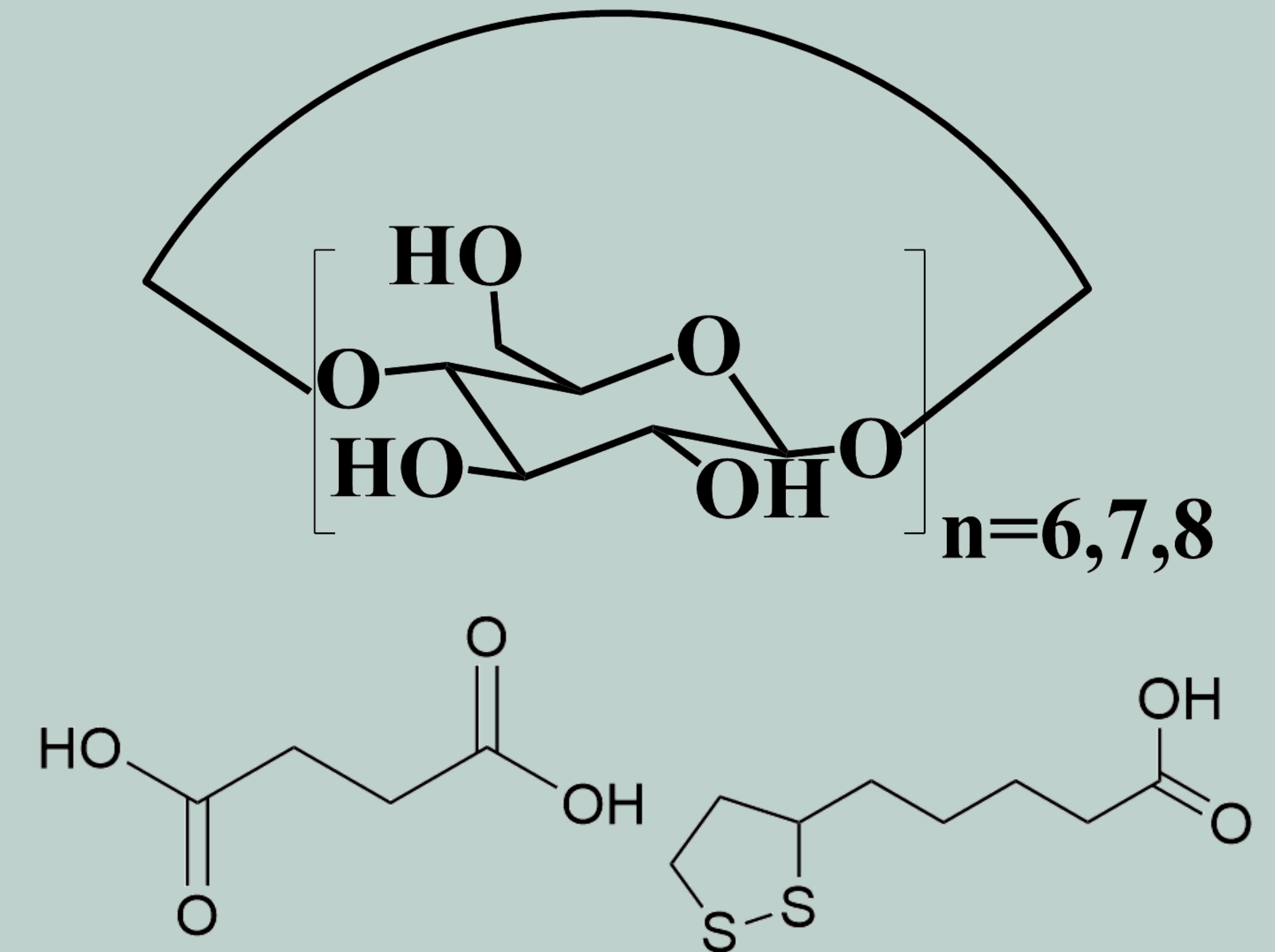
Under water testing

METHODS



SYNTHESIS

WE MODIFIED CD BY GRAFTING LIPOIC ACID (LA) AND SUCCINIC ACID (SA) ONTO IT.



PROBE TACK TESTING

WE MEASURED THE "STICKINESS" OF THE ADHESIVE WITH A PURPOSE-BUILT INDENTER.

