

# Silane functionalization of silicon cantilevers with chip holder demonstrated for chemical force imaging of switchgrass

## Objective:

- Functionalize AFM cantilevers for mapping of biomass surfaces by chemical force microscopy

## Approach:

- Develop method for functionalization of commercial silicon cantilevers with bifunctional silanes and test affinity to specific biomass polymers

## Results:

- Custom silicon chip holder designed and fabricated that holds 12 cantilevers and fits a standard polypropylene 96-well plate for fast dip coating and washing of fragile cantilever silicon tips
- Pulling forces calibrated for hydrogen bonding strengths by measurements on silicon functionalized with bifunctional silanes
- Surfaces of switchgrass cellulose and extractives free lignocellulose mapped with triethoxy silyl N-propyl gluconamide-modified cantilever
- Patent issued U. S. Patent 8,635,711 B1 (2014)

## Significance:

- Fast and reproducible multiple-step functionalization of cantilevers enables imaging of molecular chemical forces across sample soft matter surfaces including biomass.

## Part of the BER Biofuels SFA at ORNL

Lee, I, Evans, BR, G Bali, M Foston, AJ Ragauskas, "Silicon cantilever functionalization for cellulose-specific chemical force imaging of switchgrass", *Analytical Methods*, DOI: 10.1039/c5ay00455a (2015)

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Silicon chip with AFM cantilever tip

