

## Pattern changes in cotton fabrics conjugated with lactate-responsive polymers

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Boronic acids are known to reversibly form complexes with *cis*-diol compounds such as saccharides. It is also known that boronic acids can interact with  $\alpha$ -hydroxy acids in which a hydroxyl group binds to the  $\alpha$ -carbon adjacent to the carboxyl group (Figure 1). By utilizing the characteristics of boronic acid, our group have succeeded in developing thin films that exhibit colorful responses against lactic acid. In the present study, we combined the above-mentioned lactic acid-responsive thin film with cotton fabric to develop sports wears that change their patterns in response to the lactic acid concentration in sweat.

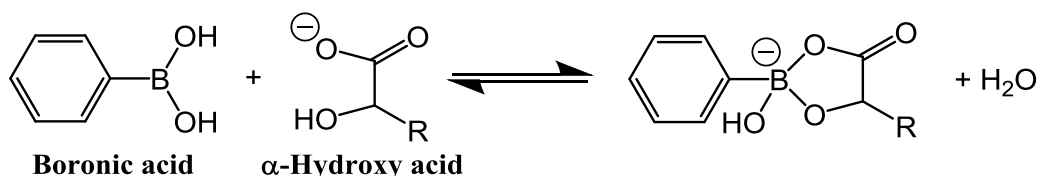


Figure 1. Interaction of boronic acid with  $\alpha$ -hydroxy acid.

Cotton fabrics combined with the lactic acid-responsive polymer were prepared as follows. First, a monomer solution containing boronic acid monomer, cationic monomer, acrylamide, crosslinker, and initiator was poured on the cotton fabric. Next, UV light was irradiated to the monomer solution through a photomask having a specific shape of transparent pattern. Using another monomer solution having different monomer composition, the same procedure was conducted on the same fabric with another photomask having different transparent pattern. Finally, it was immersed in an anionic dye solution to color the polymer formed on the fabric.

When the prepared fabric was immersed in aqueous lactic acid solution, the anionic dye was released from the domain containing boronic acid. In contrast, release of the anionic dye from the domain not containing boronic acid was less significant. As the results, pattern on the cotton fabric clearly changed with increasing lactic acid concentration as illustrated in Figure 2.

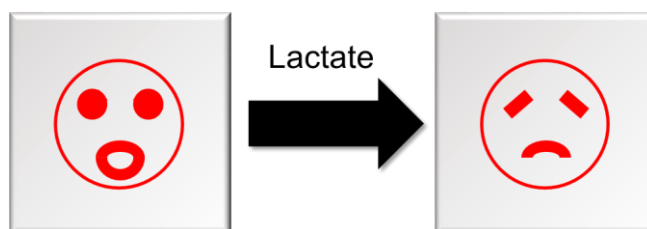


Figure 2. Schematic diagram of pattern change in cotton fabric.