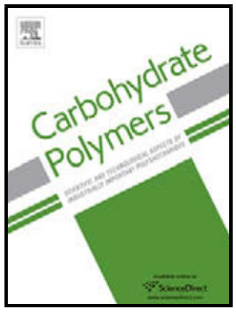

Title: EFFECT OF MICROWAVE ARGON PLASMA ON THE GLYCOSIDIC AND HYDROGEN BONDING SYSTEM OF COTTON CELLULOSE

Author: S. Prabhu K. Vaidekia S. Anitha

PII: S0144-8617(16)30999-7
DOI: http://dx.doi.org/doi:10.1016/j.carbpol.2016.08.057
Reference: CARP 11482

To appear in:

Received date: 23-5-2016
Revised date: 16-8-2016
Accepted date: 17-8-2016

Please cite this article as: Prabhu, S., Vaidekia, K., & Anitha, S., EFFECT OF MICROWAVE ARGON PLASMA ON THE GLYCOSIDIC AND HYDROGEN BONDING SYSTEM OF COTTON CELLULOSE.*Carbohydrate Polymers* http://dx.doi.org/10.1016/j.carbpol.2016.08.057

EFFECT OF MICROWAVE ARGON PLASMA ON THE GLYCOSIDIC AND HYDROGEN BONDING SYSTEM OF COTTON CELLULOSE

S. Prabhu[a1*]

[a1*] Corresponding Author : Thin film Center of Excellence, Department of Applied Science, PSG College of Technology, Peelamedu, Coimbatore – 641004, Tamil Nadu, India, +91 7708885168, csp@phy.psgtech.ac.in

K. Vaideki[a2]

[a2] Thin film Center of Excellence, Department of Applied Science, PSG College of Technology, Peelamedu, Coimbatore – 641004, Tamil Nadu, India, vaideki.krishnakumar@gmail.com

S. Anitha[a3]

[a3] Thin film Center of Excellence, Department of Applied Science, PSG College of Technology, Peelamedu, Coimbatore – 641004, Tamil Nadu, India, vp.anitha@gmail.com

Highlights:

1. Certain combinations of microwave Ar plasma process parameters improved the hydrophilicity of cotton fabric while certain other combinations reduced the same i.e., a single process gave rise to dual effect. Box-Behnken method was applied to optimize both the effects.

2. ATR-FTIR analysis revealed the strain induced in each of the O6H---O3 inter chain hydrogen bond, O3H---O5, O2H---O6 intra chain hydrogen bond, C–H---O inter sheet hydrogen bond and C-O-C glycosidic covalent bond and rotation about C5–C6 covalent bond.

3. ATR-FTIR analysis shows the lengthening of the flanking hydrogen bonds and rotation about C5–C6 covalent bond and lengthening of C-H covalent bond in the sample for which hydrophilicity was maximized. Whereas, the ATR-FTIR analysis of the sample that exhibited minimum hydrophilicity revealed the lengthening and rotation of the O2H---O6 flanking hydrogen bond and C5–C6 covalent bond.

4. The changes observed in the minimum hydrophilic sample were resisted by the shortening of the O3H---O5 intramolecular hydrogen bond and C–O–C glycosidic bond and the change in the weak inter sheet C–H---O bond length.

5. These changes lead to the alterations in the unit cell parameters and also a decrease in crystallinity which was evident from XRD studies. FESEM analysis captured the etching effect of plasma. Thus, the synergism between the structural and physical changes induced by microwave Ar plasma process was responsible for the dual behavior.