

THE USE OF GRAPHENE IN THE DEVELOPMENT OF FUNCTIONAL WOVEN FABRIC

Emre CELAYIR¹, Osman BABAARSLAN²

¹ 0009-0004-3879-4974, *Calık Denim Textile AŞ. R&D Department, Yeşilyurt/Malatya, Türkiye,*
e-mail: emre.celayir@calikdenim.com

² 0000-0002-1606-3431, *Cukurova University, Engineering Faculty, Department of Textile Engineering, Balcalı/Adana, Türkiye*
e-mail: obabaarslan@gmail.com

Abstract: Today, preliminary studies are being carried out and infrastructure is being prepared for functional textile fabrics that will be used more widely in future generations. Many functional properties have already been integrated into fabrics, but there is still a long way to go in terms of usability and efficiency. [1] Since graphene is one-atom thin, it has two dimensional, perfectly formed in a honeycomb lattice of six covalently bonded carbon atoms. Is recognized as a nanomaterial with superior properties. [2] Graphene-based wearable e-textiles are considered to be promising due to their advantages over traditional metal-based technology. [3] Molecular bond length of graphene is 0.142 nm. Graphene layers are assembled as stack to form graphite with an interplanar-spacing of 0.335 nm. Graphene layers are bound by Van der Waals force, which can easily be overcome during the exfoliation of the graphene from graphite. Electrons in graphene in room behaves like massless relativistic particles at temperature, thus graphene exhibits unique properties such as the quantum vacuum effect. This research includes functional properties of graphene denim and gabardine fabric as well as comfort and physical tests. Pre- and post-treatment fabrics will be used for these tests.

Keywords: *graphene, graphene application, functional fabric, fabric performance*

Warp and weft yarn properties of the fabric used in the experiment are given in the table below.

Table 1 Yarn composition used in the experiment

| Product | Warp | Weft |
|----------|-----------------------------------|--|
| Denim | Ne 14/1 (100% CO) | Ne 18/1 (76.67%CO 16.76%T400 6.57%LYCRA) |
| Gabardin | Ne 8,6/1 (68%ORG CO 32%RCY CO) | Ne 10/1 (87.04%ORG CO 9.31%T400 3.65%LYCRA) |



Figure 1 Graphene fabric and graphene-free standard fabric

The tests to be performed in the experiment are listed below.

- Physical Tests
- Thermal Testing
- Electrical test and rubbing fastness
- Antibacterial Activity
- Water vapor and air permeability
- Water repellency test
- Abrasion and Peeling Tests
- Light fastness, sweat fastness
- Washing resistance

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