IEC TC 113
Nanotechnology for
electrical and electronic products and systems

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ANSI NSP
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- Background
- Liaisons
- Graphene work
- US stakeholder involvement
INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

- IEC Advisory Group formed to consider new area of standardization work in nano-electrotechnology in light of growth in nano-enabled electronics
- IEC established new TC 113 in 2006
- First plenary meeting in Frankfurt in 2007
- Determine top standardization needs in the market
- Establish liaisons with TC’s and allied organizations
- First deliverable – Blank detail specification for CNT’s
TC 113 Working Group Structure

- JWG1, Terminology
- JWG2, Measurement and characterization
- WG3, Performance assessment
- WG7, Reliability assessment
- WG8, Graphene related materials, CNT materials
- WG9, Nano-enabled photovoltaics, thin film organic nano-electronics, nanoscale contacts and interconnects
- WG10, Luminescent nanomaterials
- WG11, Nano-enabled energy storage
ISO TC 229, Nanotechnologies (JWG1, JWG2)
IEC TC 1, Terminology (JWG1)
IEC TC 21, Secondary cells and batteries (WG11)
IEC TC 47, Semiconductor devices
IEC TC 82, Solar photovoltaic energy systems (WG9)
IEC TC 119, Printed electronics
IEEE, SEMI, ANF
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Blank detail specifications

- IEC 62565-3-1, Nanomanufacturing – Material specifications, Part 3-1, Blank detail specification for graphene for electrotechnical applications (Committee Draft (CD) stage)

- IEC 62565-3-2, Nanomanufacturing – Material specifications, Part 3-2, Sectional blank detail specification for nano-ink (Potential work item (PWI) stage)
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Detail specifications

- IEC/TS 62565-3-3, Nanomanufacturing – Material specifications, Part 3-3, Detail specification for single-layer graphene (PWI)

- IEC/TS 62565-3-4, Nanomanufacturing – Material specifications, Part 3-4, Detail specification for bi-layer graphene (PWI)
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Key control characteristics

- IEC/TS 62607-6-1: Graphene - Measurement of sheet resistance of commercial graphene powders by the Four Probe Method (approved work item)
- IEC/TS 62607-6-2: Graphene – Evaluation of the number of layers of graphene (approved work item)
- IEC/TS 62607-6-3: Graphene-Characterization of CVD graphene domains (CD)
Key control characteristics

- IEC/Ts 62607-6-4: Graphene - Surface conductance measurement using resonant cavity (published)
- IEC/Ts 62607-6-5: Graphene sheet resistance and contact resistance measurement using the transmission line method (PWI)
- IEC/Ts 62607-6-6: Graphene - Uniformity of strain in graphene analyzed by Raman spectroscopy (PWI)
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Key control characteristics

- IEC/TS 62607-6-7: Determination of specific surface area of graphene materials using methylene blue adsorption method (PWI)
- IEC/TS 62607-6-8: Graphene - Measurement of sheet resistance by the four-point probe method (PWI)
- IEC/TS 62607-6-9: Graphene - Measurement of sheet resistance by the non-contact Eddy current method (PWI)
Key control characteristics

- IEC/TS 62607-6-10: Graphene - Measurement of sheet resistance by terahertz time-domain spectroscopy (PWI)
- IEC/TS 62607-6-11: Graphene - Defect level of graphene analyzed by Raman spectroscopy (PWI)
- IEC/TS 62607-6-13: Determination of content of functional group of graphene materials using Boehm's titration method (PWI)
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Key control characteristics

- IEC/TS 62607-6-14: Graphene - Defect level analysis of graphene powder using Raman spectroscopy (PWI)
- ISO/TR 19733: Matrix of characterization and measurement methods for Graphene (PWI)
- Standards drive markets, so drive the standards!
- Manufacturer and customer stakeholders are critical
- Join the TC 113 TAG
Thank you!

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