

## PT. Hailiang Nova Material Indonesia

File Number: IDHL-TK-C-09 A/3

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### Technical Specification of Products

Prepared by: 王鑫林

PT Hailiang-Nova Material Indonesia		
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Reviewed by: 王磊

Approved by: 黄友明

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Performance	Tensile strength ▼ T/S (MPa)	Ordinary T/S	$\geq 300$ Mpa Or as required by the customer
		Intermediate T/S	$\geq 400$ Mpa Or as required by the customer
		High T/S	$\geq 500$ Mpa Or as required by the customer
	Elongation ▼ (%)	Ordinary T/S	$\geq 5\%$ Or as required by the customer
		Intermediate T/S	$\geq 5\%$ Or as required by the customer
		High T/S	$\geq 4\%$ Or as required by the customer
	Component Content ▼ (ppm)	Cu	Cu $\geq 99.8\%$
		Chromium content (ppm)	60-180 ppm or as required by the customer
	Surface Roughness ▼ (um)	Smooth surface Ra $\leq 0.4$ Or as required by the customer ; rough surface Rz $\leq 3.0$	
Performance	Inoxidizability ▼	140°C/15min or 150°C/10min (No oxidative discoloration)	
	Pinhole ▼ (↑/m <sup>2</sup> )	Darkroom light box: $\leq 5$ ea/m <sup>2</sup> . Under the light box, pinhole diameter < 50 μm, quantity $\leq 5$ ea/m <sup>2</sup> , or as required by the customer.	
	Seersucker	The number of string bubbles is n $\leq 5$ , the width of one string bubble is allowed to be $\leq 60$ mm, n-1 the width of the remaining (n-1) string bubbles is $\leq 40$ mm	
	Fish Scale Pattern (mm)	Can not have	

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	Wavy edge (mm)	Copper foil edge waviness $\leq 1$ mm, or as required by the customer.	
	Wettability $\nabla$ (mN/m)	$\geq 38$ Or as required by the customer	
	(mm) Loose	$\leq 8$ mm Or as required by the customer	
	Black spot/White spot	On a $30 \times 30$ cm <sup>2</sup> copper foil, the number of black/white spots $\leq 3$ is acceptable, with black/white spot diameter $\leq 0.2$ mm, or as required by the customer.	
	End Face Copper Scrap $\blacktriangledown$ ( $\mu$ m)	$\leq 45$ Or as required by the customer	
	Warping $\nabla$ (mm)	$\leq 10$ mm or as required by the customer	
	Width $\nabla$ (mm)	$L \pm 1$ mm Or as required by the customer	
	Winding Length (m)	According to customer requirements	
	Gloss (GU)	Glossy: 60~120 S/S 60~120 Matte: 60~280 M/S 60~280	Glossy: 60~120 S/S 60~120 Matte: 80~400 M/S 80~400
Others	RoHS $\blacktriangledown$ (ppm)	Comply with RoHS instructions	
	Exterior	The foil has clean and tidy surface, smooth surface, uniform color, no concave and convex spots, no spots, no oxidation, no wrinkles and scratches, no foreign matter inclusions, no gaps at the edges, no copper wires at the cut surface and no curling edges.	

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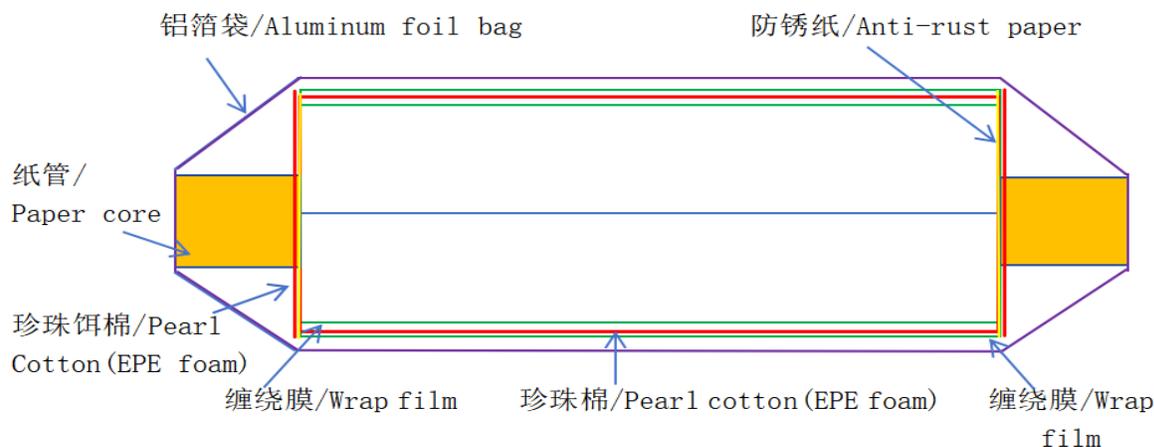
Chemical parameter:		
Category	Chemical Index	Technology Standard
Copper Dissolving Tank Parameters	Copper Concentration	110~180 g/L
	Acid Concentration	0~80g/L
Liquid Cleaning Tank	Cu <sup>2+</sup> concentration ▽	General Tensile/Medium Tensile: 88-92g/L
	H <sub>2</sub> SO <sub>4</sub> concentration ▽	General Tensile/Medium Tensile: 100-110 g/L
	Cl <sup>-</sup> concentration ▽	General Tensile: 20±5 ppm Medium Tensile: 26±6 ppm
Liquid Cleaning Tank	Temperature ▽	52~56°C
Anti-Oxidation Parameters	Cr <sup>6+</sup> concentration ▽	500~800 mg/L
	pH Value	2~4
Safety, Laws, and Regulations	RoHS ▼	Third-party testing
	ReaCH ▼	Third-party testing
	Halogen Report ▼	Third-party testing

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**Guarantee period:** After arrival, it can be stored for 3 months in an environment of 0-30°C and ≤75%RH. Our factory will keep all customer roll samples for 3 months (full width \* 300mm).

**And label of packaging joints:** The number of joints: less than 1 (inclusive)/roll and the number of joints in a single batch accounts for less than 40%; Marking: affix a black mark (20mm \* 30mm) on the joint; Tail marking: a black mark (20mm \* 30mm) shall be affixed at the position 1~2m away from the tail of the roll; Volume: according to customer requirements.

Packaging schematic diagram:



Inside Label: Reel Number, Description, Batch, Spec, Area Weight, Net Weight, Length, Inspection, Date, Protection Mark

External Label: Box No, P.O. No, Description, Material No, Spec, Lot No, Net Weight, Shipping Date, Gross Weight, Production Date, Volumes, Quality Guarantee Period, Inspection, Storage Term RoHS mark, Protection mark.

**Other:** If there is any dispute in the content of this specification, it can be amended after the agreement of both parties.

RoHS-compliant products do not contain other harmful substances.

There are significant changes in the manufacturing process (major raw materials, major processes, major equipment changes), and the delivery can only be continued after the customer's permission.