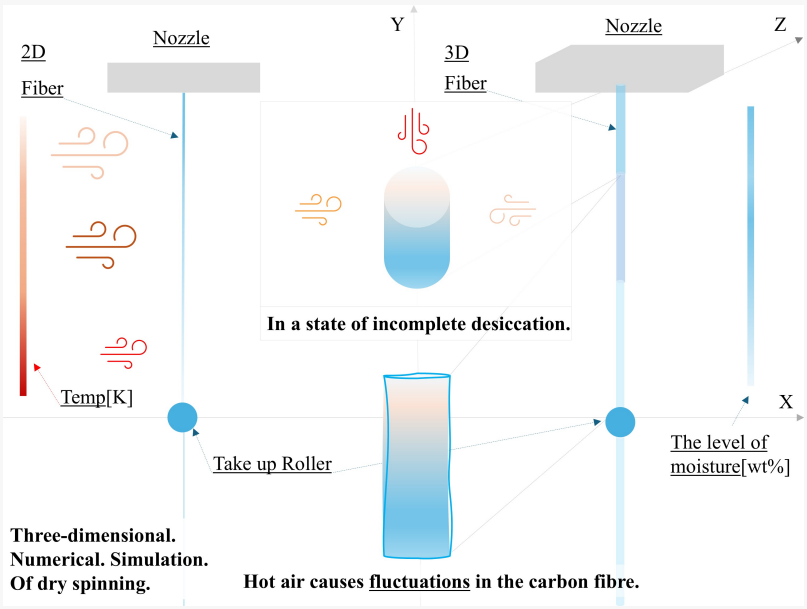
Theoretical Framework for Three-Dimensional Simulation of Dry Spinning in Carbon Fiber Production for Hydrogen Tanks

Establishment of a Theoretical Framework for Three-Dimensional Numerical Simulation of Dry Spinning in Carbon Fiber Production for Hydrogen Vehicle Tanks



Three-dimensional. Numerical. Simulation. Of dry spinning.

TOYOTA CITY, AICHI, JAPAN, July 8, 2025 /EINPresswire.com/ -- Yorozukiiru Co., Ltd. (Representative Director and President: Tatsuhiro Yamamoto), also known by the pen name Fu Ryu, today announced a groundbreaking theoretical framework for three-dimensional simulation of the dry spinning stage in carbon fiber production for high-pressure hydrogen tanks.

The new methodology enables fully three-dimensional numerical simulation of fiber and surrounding fluid interactions during dry spinning. By visualizing diameter reduction along three perpendicular axes for each fiber, it offers unprecedented insight into how hot-air exposure impacts fiber thinning. The generalized framework is compatible with major commercial solvers, facilitating seamless integration into existing R&D workflows.

Key Technical Highlights:
- Trade-off Management: Balances hot-air velocity and temperature to maintain ideal fiber moisture levels
- Scalability: Framework principles apply to spinnerets with varied nozzle counts, supporting flexible production scales
- Energy Efficiency: Enables smart hot-air utilization strategies to lower energy usage without compromising fiber quality

“Our fully three-dimensional simulation paradigm abandons legacy semi-empirical correlations such as Nusselt-based models,” said Fu Ryu (Yamamoto). “Most commercial solvers still rely on

one-dimensional analyses that can’t predict critical moisture gradients or the ‘dry-to-touch’ condition essential for high-performance carbon fiber. This breakthrough could reshape advanced materials processing for hydrogen mobility.”
For technical documentation, simulation visuals, or partnership inquiries, please contact the Advanced Development Division below.

About Yorozukiiru Co., Ltd.
Founded in 2024 and headquartered in Toyota City, Aichi Prefecture, Japan, Yorozukiiru Co., Ltd. specializes in advanced materials research and simulation technologies for hydrogen mobility. Its mission is to accelerate clean energy vehicle development through computational modeling and process innovation.

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