

Development History of PAN based Carbon Fiber Technology

Year	World Carbon Fiber Technology Development and Other Related Activities	Carbon Fiber Technology Development by Toray	Carbon Fiber Technology Development by Mitsubishi Rayon	Carbon Fiber Technology Development by Toho Tenax
1952	U.S.A.: DuPont had developed Orlon technology by this year.	Toray commenced basic research activity for acrylic fiber development.		
1954	U.S.A.: UCC started selling high-tension-rayon based fiber Thernel-25.			
1957	U.S.A.: Barnebey-Cheney started selling carbon fiber-tow, mat, and rayon based cotton. Japan: Asahi Kasei and other companies published materialization of acrylic fiber commercial production.			
1958	U.S.A.: National Carbon, a subsidiary of UCC, supplied rayon-based carbon fiber to Air Force Material Laboratory (AFML).			
1959	Japan: Dr. Shindo, a member of Osaka Technical Laboratory (OTL), filed a basic patent applications relating to PAN-based graphite fiber technology (Patent publication SHO-37-4405 and -38-12375)	Toray registered its trade mark "Toraylon".		
1960	Japan: Asahi, a newspaper publisher, reported achievement of Dr. Shindo's above-mentioned R&D			
1961	Japan: Dr. Shindo published his technical reports relating to PAN-based graphite fiber on Journal of OTL.	Toray commenced its R&D for carbon fiber technology.		
1962	Japan: OTL, Nihon Carbon, Tokai Electrode, Matsushita Electric, and Nitto Textile started carrying out of R&D of carbon fiber technology.			
1963	U.K. Royal Air Public Corporation (RAE) succeeded production of PAN-based highly-elastic carbon fiber.			
1964	"U.K. Royal Research & Development Corporation (NRDC) obtained a patent right relating to highly-elastic carbon fiber and nation-wide development project of carbon fiber in U.K. was commenced. Japan Nihon Carbon and Tokai Electrode respectively announced commercialization of carbon fiber production based on OTL technology."			
1965	U.K. Royal Nuclear Power Corporation (AERA) commenced R&D of industrial production technology of carbon fiber.			
1966				
1967	U.K. Rolls-Royce carried out development of commercial jet engine using carbon fiber.			
1968		Toray filed three patent applications relating to carbon fiber.		
1969			Mitsubishi Rayon commenced its basic R&D for precursor technology.	Toho Tenax commenced its R&D for development of precursor and carbon fiber technology.
1970		Toray got license of Dr. Shindo's patent rights.		
1971		Toray started commercial production of its carbon fiber "Torayca".		
1972	Japan: A Japanese company Olympic displayed its fishing rod for fishing of Ayu fish, "Seiki", made of Toray's "Toreka" at a trade fair. Pacific Masters Golf Tournament: Gay Brewers won championship using golf clubs having carbon fiber shaft, which stirred boom to buy and use "black shaft golf clubs".			Toho Tenax commenced its R&D of carbon fiber technology at its pilot scale plant.
1975				Toho Tenax determined commercialization of its carbon fiber technology and started up its carbon fiber commercial production.
1976			Mitsubishi Rayon started its market development using imported intermediate carbon fiber products and commenced its own commercial production of intermediate carbon fiber products.	
1977			Mitsubishi Rayon was granted license of HITOCO's carbon fiber calcinations technology and started import of carbon fiber from other producers.	
1981			Mitsubishi Rayon commenced its commercial calcinations of carbon fiber.	