

# Issues of Energy and Environmet in 21st Century and Functional Carbon Materials to Solve the Issues

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We meet three issues of energy and environment in 21<sup>st</sup> century.

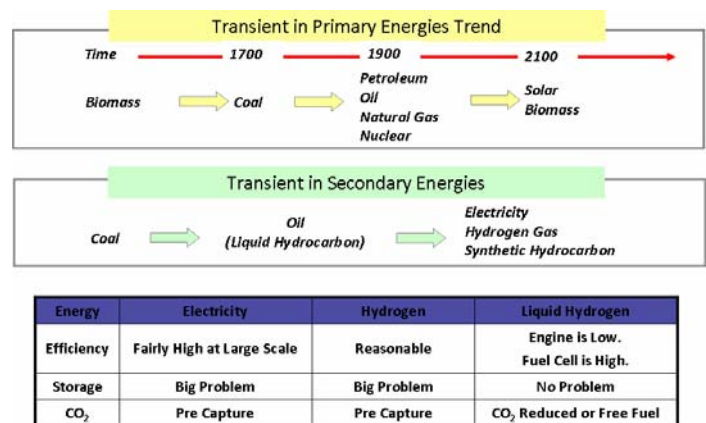
1. Huge increase of energy demand due to marked increase of pollution in developed and emerging countries
2. Limited supply of fossil energy, limits of nuclear energy use, and low efficiency and high cost of renewable energy, but the inevitable transition to it
3. CO<sub>2</sub> and other environmental issues in relation to energy consumption.

We need numbers of breakthrough in the technology for energy, materials and environment.

1. Higher efficiency in production, transformation and use of available energy sources
2. Increasing supply of energy sources
3. Reduction of CO<sub>2</sub> emission not to increase its concentration in the atmosphere while fossil resources are available

The transient in the primary and secondary energy as summarized in Figure 1 must be recognized definitely. The technology and responding society can define the transients. Japanese government set up 21 technologies in Figure 2 to be prioritized. They cover almost all technologies to be developed in this century if we are allowed to expand a little their scopes.

In my talk, I try to emphasize the importance of carbon materials and fossil resources as the feed for energy and carbon materials. The preparation and modification / functionalization of carbon materials are summarized in Figure 3. I picked up several examples in traditional and novel carbon materials to review their importance.



*Petroleum and Its Derived or Related Liquid Fuels Can Be Last Forever.*

Fig. 1 Transient in primary and secondary energy

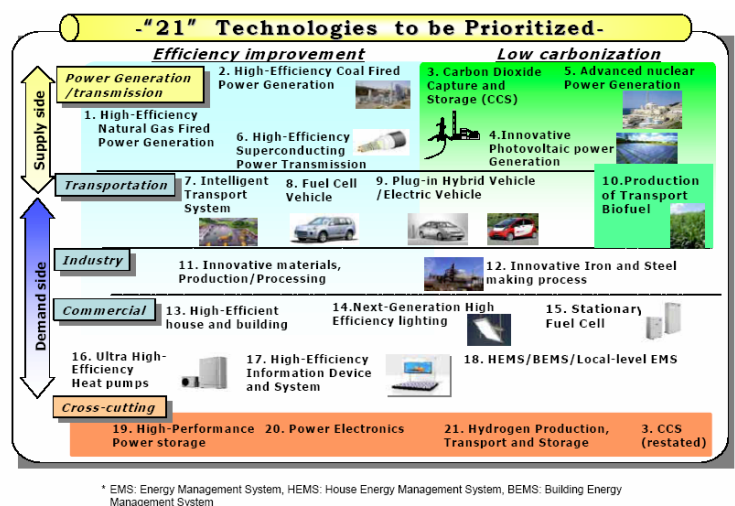


Fig. 2 Innovative energy technology to be prioritized

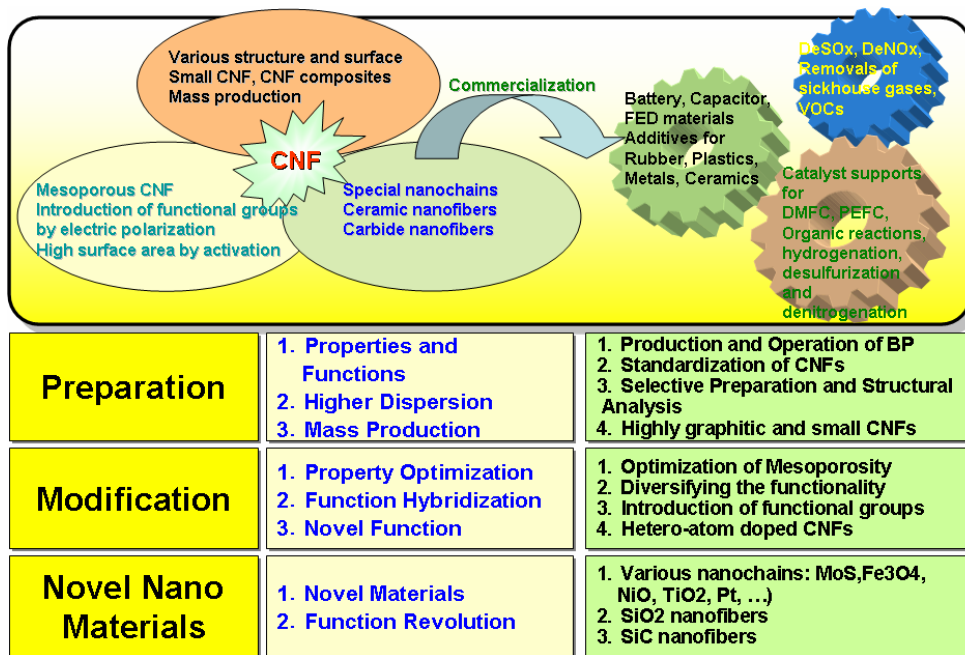


Fig. 3 Preparation and modification of CNF