

Catalytic Decomposition of Methane over Rubber-Grade Carbon Blacks : Comparison of Fluffy and Pelletized Types

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Catalytic activities of fluffy and pelletized rubber-grade carbon blacks for decomposition of methane to produce CO₂-free hydrogen were compared. The methane decomposition reaction was carried out under atmospheric pressure at 1123-1223K in a fixed-bed reactor. Rubber-grade carbon blacks (DCC carbon blacks) exhibited stable catalytic activity for decomposition of methane. Fluffy carbon blacks exhibited considerably higher activity and activation energy than pelletized carbon blacks of the same grade. These differences are considered due to the binder in the pelletized carbon blacks that was added during pelletization. The binder seems to block a considerable portion of the active sites on the carbon black surface, especially to preferentially block those active sites which need higher activation energy. The reaction order for fluffy DCC carbon blacks was near unity (0.86 ~ 0.99) while that of pelletized DCC carbon blacks was near 2/3 (0.62 ~ 0.71). For both fluffy and pelletized carbon blacks, a tendency was observed that the activation energy increased with the primary particle size or decrease of the specific surface area.