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10.14 Development of tracer contained compact toroid injection system

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In the development of magnetic confined fusion reactors, the accumulation of impurities is one of the most important subjects for concern because it potentially causes cooling down of the hot plasma. On the other hand, appropriate radiation from localized impurity might mitigate the heat load onto the divertor plate. The tracer-encapsulated solid pellet (TESPEL) has generated certain results in these studies. However, the TESPEL technique has several points to be improved, e.g. a penetration depth, increase in amount of the tracer impurity, and so on. In this study, tracer contained compact toroid (TCCT) injection system utilizing a magnetized coaxial plasma gun (MCPG) has been developed. Discharge current on the MCPG sputters and ionizes the electrode material such as tungsten and accelerate it by the Lorenz-self force. The MCPG easily accelerate the plasmoid higher than the ion thermal velocity of several tens km/s. The accelerated and ejected plasmoid containing tracer ions is warm ionized plasma itself. Therefore, the TCCT is potentially injected the core region of target plasma. Behavior of tracer ions in the compact toroid injected into the transverse magnetic field has been experimentally investigated.

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