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The First H-mode Operation in Helium Plasma by RF-Heating on EAST BIN ZHANG, XIANZU GONG, JINPING QIAN, Institute of Plasma Physics, Chinese Academy of Sciences, Hefei 230031, China — Physics understanding of helium plasmas are key issues for the first operational phase of ITER, in order to minimize activation of the in-vessel components. On EAST, a comprehensive set of H-mode experiments have been successfully performed in helium plasmas by pure RF-heating with ITER-like tungsten mono-block divertor to determine the requirement for low rotation operation and plasma-wall interaction in ITER. The H-mode threshold power is observed to be higher than the scaling law in deuterium plasma by a factor of 1.4 when density exceed n_{min} =3.2x10^{19}/m^3 (n_{min}: the density at the minimum power threshold) and increased rapidly towards lower density. For energy confinement and pedestal characteristics in helium plasmas, the helium concentration (He_{conc}) is confirmed to play a crucial role. Type-I ELMy H-modes (f_{ELM} =10-30Hz) have been achieved with high performance ($H_{98(y,2)}$ >1.0) when He_{conc}<60%. Only Type-III ELMy H-mode could be realized under power injection (P_{inj}) of 4.6MW while He_{conc} in the range of 60%-70%. It is hard to access H-mode in the condition of He_{conc}>70% even with higher power around P_{inj} =6.0MW. Small/no ELMs with good confinement are also found in helium H-mode plasmas. These investigations are carried out for various plasma parameters, plasma configurations and optimization of auxiliary heating methods. ELM stabilizations and suppressions are demonstrated by resonant magnetic perturbation and boron particles injection.

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