The aim of work is to numerically study the influences of the impurities in the hybrid discharge with high power in the JET ILW in DD and DT scenarios. Numerical simulations with the COREDIV code of hybrid discharges with 32MW auxiliary heating, 2.2MA plasma current and 2.8T toroidal magnetic field in the ITER-like wall (ILW) corner configuration are presented. In the simulations 5 impurities species are used: intrinsic (beryllium (Be) and nickel (Ni)) from wall, He from reaction DT, tungsten (W) from divertor) and extrinsic (Ne, Ar, and Ni) concentration. The main contributors to increase of ZEFF is Ni and W, which is effect of the high electron temperature. For normalize radius of 0.5 the dominating ionization state for Ni is Ni^4+, but for W is W^5+.

Influence of the impurities in the hybrid discharges with high power in JET ILW

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** Energy balance equation with transport modelled to reproduce q_e defined by ELMY H-mode scaling

\[
\frac{\partial n_i}{\partial t} + \nabla \cdot (n_i \mathbf{v}_i) = \frac{\partial}{\partial \tau} \sum_{\gamma} \left[ \frac{\partial}{\partial \tau} \left( j_{\gamma,i} \right) - \nabla \cdot \left( j_{\gamma,i} \mathbf{v}_i \right) \right] + q_{\gamma,i} - \sum_{\gamma} \alpha_{\gamma,i} n_i - \sum_{\gamma} \beta_{\gamma,i} n_i
\]

The transport coefficients are described by the following model:

- **Main ions:**
  \[
  j_{\gamma,i} = \frac{e^2}{m_i} \cdot \nabla \phi \cdot \mathbf{v}_i - \frac{e^2}{m_i} \left( \mathbf{v}_i - \mathbf{v}_{\gamma,i} \right) \cdot \mathbf{B} \cdot \nabla \times \mathbf{B} \cdot (n_i \mathbf{v}_i)
  \]

- **Impurity ions:**
  \[
  j_{\gamma,i} = \frac{e^2}{m_i} \cdot \nabla \phi \cdot \mathbf{v}_i - \frac{e^2}{m_i} \left( \mathbf{v}_i - \mathbf{v}_{\gamma,i} \right) \cdot \mathbf{B} \cdot \nabla \times \mathbf{B} \cdot (n_i \mathbf{v}_i)
  \]

- **Impurity transport:**
  \[
  j_{\gamma,i} = \frac{e^2}{m_i} \cdot \nabla \phi \cdot \mathbf{v}_i - \frac{e^2}{m_i} \left( \mathbf{v}_i - \mathbf{v}_{\gamma,i} \right) \cdot \mathbf{B} \cdot \nabla \times \mathbf{B} \cdot (n_i \mathbf{v}_i)
  \]

In the model we have two options:
1. to fix H98, the parameter C2 is adjusted to keep the calculated confinement time obtained from the solution equal to the value defined by the scaling law in absence of impurities.
2. to fix C2 and therefore the confinement will be changed accordingly with changes to the seeding level.

By increasing the radiation with impurity seeding, the net heating power decreases, thus when using the first option transport is reduced in order to keep the total plasma energy constant.

**Boundary conditions:**
- Main ions: n_i, n_e, T_e, T_i - from SOL model
- Impurity: n_i, T_i - calculated from core model

**SOL PLASMA**
- 2D multidiffusion transport based on Braginskii equations
- Particle balance, parallel momentum, two energy equations
- Transport: parallel - classical, radial - anomalous
- Slab geometry (lack of PEL, drifts neglected)
- Atomic processes: ionization, excitation, charge exchange
- Analytical model for neutrals accounts for plasma recycling and impurity sputtering
- Boundary conditions: sheath, density lengths; input fluxes from core model

**EXPERIMENT AND SIMULATIONS FOR DD PLASMA**

**CONCLUSIONS:**

- The COREDIV code has been used to perform self-consistent core-edge simulations of DT and TT plasmas.
- Extrapolation to higher auxiliary heating and DT operation shows decisive influence of the power on plasma parameters: increase of the W concentration and radiation in the core by about 25%.
- In the case with Ar seeding lower plasma confinement is predicted.