In[ ]:=
```
Clear["Global`*"]
(*Variable values:*)
phi0 = 4 / 10; (*initial colloid volume fraction*)
h0 = 4; (*initial height of the interface*)
a = 0.00033;(*size of RBC in cm*)
drho = 80 * 10^(-6);
(*density difference between the colloids and the suspending medium*)
g = 981;(*cm/s^2*)
eta = 0.000012; (*suspending medium viscosity*)
phim = 86 / 100; (*maximum colloid volume fraction*)
hm = h0 * phi0 / phim ;(*minimum height of the interface*)
```

In[ ]:=
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(*Integration:*)
tfinal = 10^16;
df1 = 1.7;
hsol1 = NDSolveValue[{h'[t] ==
      -((drho * g * a^2) / eta) * (phim - phi0 * h0 / (h[t]))^3 *
       ((phi0 * h0 / (h[t]))^(1 + 2 / (df1 - 3))) / ((1 - phi0 * h0 / (h[t]))),
     h[0] == h0}, h, {t, 0, tfinal}];
df2 = 1.8;
hsol2 = NDSolveValue[{h'[t] ==
      -((drho * g * a^2) / eta) * (phim - phi0 * h0 / (h[t]))^3 *
       ((phi0 * h0 / (h[t]))^(1 + 2 / (df2 - 3))) / (1 - phi0 * h0 / (h[t])),
     h[0] == h0}, h, {t, 0, tfinal}];
df3 = 1.9;
hsol3 = NDSolveValue[{h'[t] ==
      -((drho * g * a^2) / eta) * (phim - phi0 * h0 / (h[t]))^3 *
       ((phi0 * h0 / (h[t]))^(1 + 2 / (df3 - 3))) / ((1 - phi0 * h0 / (h[t]))),
     h[0] == h0}, h, {t, 0, tfinal}];
df4 = 2;
hsol4 = NDSolveValue[{h'[t] ==
      -((drho * g * a^2) / eta) * (phim - phi0 * h0 / (h[t]))^3 *
       ((phi0 * h0 / (h[t]))^(1 + 2 / (df4 - 3))) / ((1 - phi0 * h0 / (h[t]))),
     h[0] == h0}, h, {t, 0, tfinal}];
df5 = 2.1;
hsol5 = NDSolveValue[{h'[t] ==
      -((drho * g * a^2) / eta) * (phim - phi0 * h0 / (h[t]))^3 *
       ((phi0 * h0 / (h[t]))^(1 + 2 / (df5 - 3))) / ((1 - phi0 * h0 / (h[t]))),
     h[1] == h0}, h, {t, 0, tfinal}];
df6 = 2.2;
hsol6 = NDSolveValue[{h'[t] ==
      -((drho * g * a^2) / eta) * (phim - phi0 * h0 / (h[t]))^3 *
       ((phi0 * h0 / (h[t]))^(1 + 2 / (df6 - 3))) / ((1 - phi0 * h0 / (h[t]))),
     h[0] == h0}, h, {t, 0, tfinal}];
df7 = 2.3;
hsol7 = NDSolveValue[{h'[t] ==
      -((drho * g * a^2) / eta) * (phim - phi0 * h0 / (h[t]))^3 *
       ((phi0 * h0 / (h[t]))^(1 + 2 / (df7 - 3))) / ((1 - phi0 * h0 / (h[t]))),
     h[0] == h0}, h, {t, 0, tfinal}];
df8 = 2.4;
hsol8 = NDSolveValue[{h'[t] ==
      -((drho * g * a^2) / eta) * (phim - phi0 * h0 / (h[t]))^3 *
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        ((phi0 * h0 / (h[t])) ^ (1 + 2 / (df8 - 3))) / ((1 - phi0 * h0 / (h[t]))),
      h[0] == h0}, h, {t, 0, tfinal}];
df9 = 2.5;
hsol9 = NDSolveValue[{h'[t] ==
    -((drho * g * a^2) / eta) * (phim - phi0 * h0 / (h[t])) ^3 *
      ((phi0 * h0 / (h[t])) ^ (1 + 2 / (df9 - 3))) / ((1 - phi0 * h0 / (h[t]))),
    h[0] == h0}, h, {t, 0, tfinal}];
df10 = 2.6;
hsol10 = NDSolveValue[{h'[t] ==
    -((drho * g * a^2) / eta) * (phim - phi0 * h0 / (h[t])) ^3 *
      ((phi0 * h0 / (h[t])) ^ (1 + 2 / (df10 - 3))) / ((1 - phi0 * h0 / (h[t]))),
    h[0] == h0}, h, {t, 0, tfinal}];
df11 = 2.7;
hsol11 = NDSolveValue[{h'[t] ==
    -((drho * g * a^2) / eta) * (phim - phi0 * h0 / (h[t])) ^3 *
      ((phi0 * h0 / (h[t])) ^ (1 + 2 / (df11 - 3))) / ((1 - phi0 * h0 / (h[t]))),
    h[0] == h0}, h, {t, 0, tfinal}];
df12 = 2.8;
hsol12 = NDSolveValue[{h'[t] ==
    -((drho * g * a^2) / eta) * (phim - phi0 * h0 / (h[t])) ^3 *
      ((phi0 * h0 / (h[t])) ^ (1 + 2 / (df12 - 3))) / ((1 - phi0 * h0 / (h[t]))),
    h[0] == h0}, h, {t, 0, tfinal}];
df13 = 2.9;
hsol13 = NDSolveValue[{h'[t] ==
    -((drho * g * a^2) / eta) * (phim - phi0 * h0 / (h[t])) ^3 *
      ((phi0 * h0 / (h[t])) ^ (1 + 2 / (df13 - 3))) / ((1 - phi0 * h0 / (h[t]))),
    h[0] == h0}, h, {t, 0, tfinal}];

(*Plot:*)
tfplot = 3 * 10^4;
legendl = {"1.7", "1.8" , "1.9", "2.0", "2.1", "2.2",
   "2.3", "2.4", "2.5", "2.6", "2.7", "2.8", "2.9", Subscript[h, m]};
coll = Table[Hue[0.65 * i / Length[legendl]], {i, 1, Length[legendl]}];
p1 = Plot[{hsol1[t], hsol2[t], hsol3[t], hsol4[t], hsol5[t], hsol6[t], hsol7[t],
   hsol8[t], hsol9[t], hsol10[t], hsol11[t], hsol12[t], hsol13[t], hm},
  {t, 0, tfplot}, PlotRange → {0, h0}, AxesLabel → {t, h[t]}, PlotPoints → 1000
  (*,PlotLabel→"Height of the interface"*), PlotLegends → legendl,
  PlotStyle → coll, LabelStyle → Directive[FontSize → 14]]
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In[•]:=
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(*Export picture:*)
Export[NotebookDirectory[] <> "1D_h(t)_plot_df.png", p1, ImageResolution → 1000]
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```
(*LogLinearPlot:*)
tfplot = 10^7;
legendl = {"1.7", "1.8" , "1.9", "2.0", "2.1", "2.2",
   "2.3", "2.4", "2.5", "2.6", "2.7", "2.8", "2.9", Subscript[h, m]};
coll = Table[Hue[0.65 * i / Length[legendl]], {i, 1, Length[legendl]}];
p2 = LogLinearPlot[{hsol1[t], hsol2[t], hsol3[t], hsol4[t], hsol5[t], hsol6[t],
   hsol7[t], hsol8[t], hsol9[t], hsol10[t], hsol11[t], hsol12[t], hsol13[t], hm},
  {t, 10^(-7), tfplot}, PlotRange → {0, h0}, AxesLabel → {t, h[t]},
  PlotPoints → 1000, (*PlotLabel→"Height of the interface",*)
  PlotLegends → legendl, PlotStyle → coll, LabelStyle → Directive[FontSize → 14]]
```

In[ ]:=
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(*Export picture:*)
Export[NotebookDirectory[] <> "1D_h(t)_Logplot_df.png", p2, ImageResolution → 1000]
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