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

In[ ]:= (*Integration:*)
tfinal = 10^16;
df1 = 1.7;
hsol1 = NDSolveValue[{h'[t] ==
  - ((drho * g * a^2) / mu) * (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) / mu) * (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) / mu) * (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) / mu) * (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) / mu) * (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) / mu) * (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) / mu) * (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) / mu) * (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) / mu) * (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) / mu) * (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) / mu) * (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) / mu) * (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) / mu) * (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}];

In[ ]:= (*Plot:*)
tfplot = 3 * 10^4;
legend1 = {"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[legend1]], {i, 1, Length[legend1]}];
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,
  PlotLegends -> legend1, PlotStyle -> coll, LabelStyle -> Directive[FontSize -> 14]]

In[ ]:= (*Export picture:*)
Export[NotebookDirectory[] <> "1D_h(t)_plot_df.png", p1, ImageResolution -> 1000]

In[ ]:= (*LogLinearPlot:*)
tfplot = 10^7;
legend1 = {"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[legend1]], {i, 1, Length[legend1]}];
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 -> legend1, PlotStyle -> coll, LabelStyle -> Directive[FontSize -> 14]]

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

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