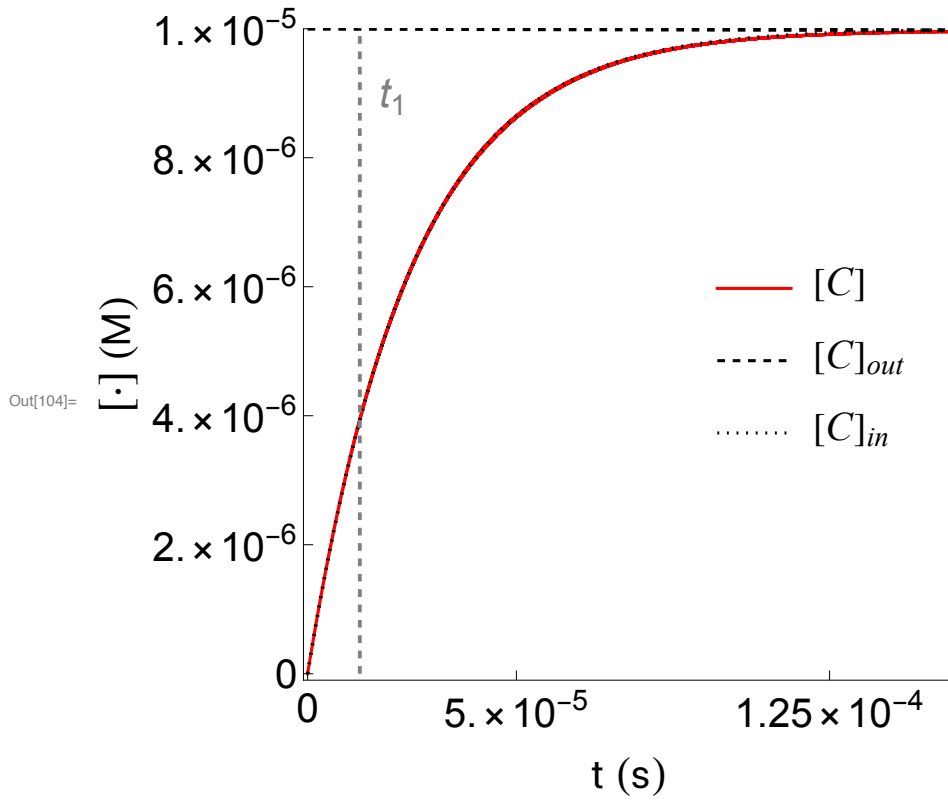


```

In[90]:= (* --- rQSSA ----- *)
k1 = 4 * 10^6; k2 = 15; k0 = 25; (*=k_{-1}*)
Km = (k0 + k2) / k1;
s0 = Km; e0 = 10^(3) * s0;
c0 = 0; p0 = 0; T0 = s0 + c0;
A1 = s0 + c0 + p0; A2 = e0 + c0;
t1 = A1 / (k1 * (Km + A1) * A2); t2 = 1 / (k1 * (Km + A1));
tend = 0.000155;
epsilon = (Km + A1) / A2;
l = (s0 + c0) / A1;
s =.; e =.; c =.; p =.;
Sol = NDSolve[{D[s[t], t] == -k1 * e[t] * s[t] + k0 * c[t],
  D[e[t], t] == -k1 * e[t] * s[t] + (k0 + k2) * c[t],
  D[c[t], t] == k1 * e[t] * s[t] - (k0 + k2) * c[t], D[p[t], t] == k2 * c[t],
  s[0] == s0, e[0] == e0, c[0] == c0, p[0] == p0}, {s, e, c, p}, {t, 0, tend}];
Plot3 = Plot[Evaluate[c[t] /. First[Sol]], {t, 0, tend}, MaxRecursion -> 15,
  PlotPoints -> {200 000, 100 000}, Mesh -> False, AxesLabel -> {t, c},
  PlotRange -> {{0, tend}, {-10^(-7), 0.00001}}, PlotStyle -> Red,
  FrameLabel -> {Style["t (s)", FontFamily -> "MS Serif", FontSize -> 21],
  Style["[.] (M)", FontFamily -> "MS Serif", FontSize -> 21]},
  RotateLabel -> True, Frame -> {{Automatic, False}, {Automatic, False}}];
Pcex = Plot[l * A1 * Exp[-k2 * t], {t, 0, tend}, PlotPoints -> 4000, Mesh -> False,
  AxesLabel -> {t, ce}, PlotRange -> {{0, tend}, {-10^(-7), 0.00001}},
  PlotStyle -> {Thick, Dashed, Black},
  FrameLabel -> {Style["t (s)", FontFamily -> "MS Serif", FontSize -> 21],
  Style["[.] (M)", FontFamily -> "MS Serif", FontSize -> 21]},
  RotateLabel -> True, Frame -> {{Automatic, False}, {Automatic, False}}];
Pcin = Plot[c0 + s0 * (1 - Exp[-k1 * A2 * t]), {t, 0, tend}, PlotPoints -> 4000,
  Mesh -> False, AxesLabel -> {t, ci}, PlotRange -> {{0, tend}, {-10^(-7), 0.00001}},
  PlotStyle -> {Thick, Dotted, Black},
  FrameLabel -> {Style["t (s)", FontFamily -> "MS Serif", FontSize -> 21],
  Style["[.] (M)", FontFamily -> "MS Serif", FontSize -> 21]},
  RotateLabel -> True, Frame -> {{Automatic, False}, {Automatic, False}}];
Show[Plot3, Pcex, Pcin,
  ParametricPlot[{t1, u}, {u, 0, 0.000015}, PlotStyle -> {Gray, Dashed, Thick}],
  PlotRange -> {{-0.000001, tend}, {-10^(-7), 0.00001}},
  Epilog -> {Inset[Column[{LineLegend[{Red, {Black, Dashed}, {Black, Dotted}},
  {"[C]", "[C]_out", "[C]_in"}], LabelStyle -> {FontFamily -> "Times New Roman",
  FontSize -> 21, FontSlant -> Italic}]}], Scaled[{0.78, 0.49}]],
  Inset[Graphics[{Gray, Text[Style["t1", 21]}], {t1 + 0.000008, 0.000009}]],
  MaxRecursion -> 1000, PlotPoints -> {200 000, 100 000},
  AspectRatio -> 1,
  AxesOrigin -> {0, 0},
  RotateLabel -> True,
  LabelStyle -> {21, GrayLevel[0]},
  FrameTicks -> {{{#, ScientificForm@#} & /@
  {0, 0.000002, 0.000004, 0.000006, 0.000008, 0.00001}, None},

```

```
{ {#, ScientificForm@#} & /@ {0, 0.00005, 0.000125}, None}},  
LabelStyle -> {21, GrayLevel[0]}, ImageSize -> {450, 450},  
AspectRatio -> Full, PlotLabel -> None]
```



In[105]=

In[106]:=

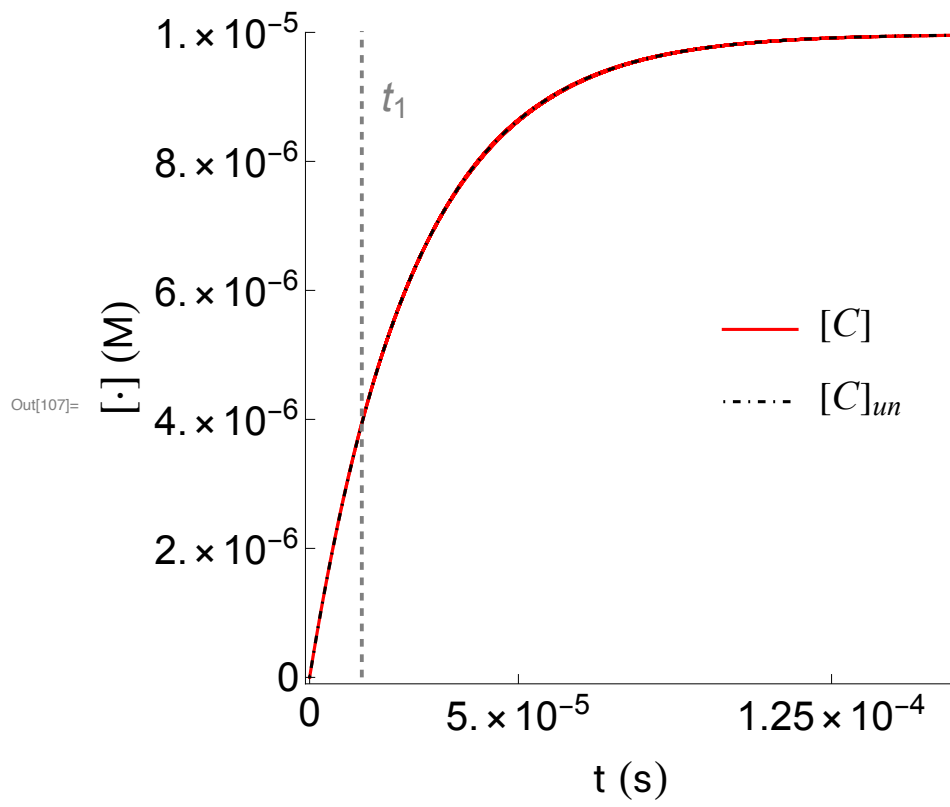
```

Pcu = Plot[c0 * Exp[-k2 * t] + s0 * (Exp[-k2 * t] - Exp[-k1 * A2 * t]),
  {t, 0, tend}, PlotPoints → 4000, Mesh → False, AxesLabel → {t, cu},
  PlotRange → {{0, tend}, {-10^(-7), 0.00001}}, PlotStyle → {Black, DotDashed},
  FrameLabel → {Style["t (s)", FontFamily → "MS Serif", FontSize → 21],
  Style["[.] (M)", FontFamily → "MS Serif", FontSize → 21]},
  RotateLabel → True, Frame → {{Automatic, False}, {Automatic, False}}];

Show[Plot3, Pcu,
  ParametricPlot[{t1, u}, {u, 0, 0.000015}, PlotStyle → {Gray, Dashed, Thick}],
  PlotRange → {{-0.000001, tend}, {-10^(-7), 0.00001}},
  Epilog → {Inset[Column[{LineLegend[{Red, {Black, DotDashed}},
  {"[C]", "[C]un"}], LabelStyle → {FontFamily → "Times New Roman",
  FontSize → 21, FontSlant → Italic}]]], Scaled[{0.78, 0.49}]],
  Inset[Graphics[{Gray, Text[Style["t1", 21]}], {t1 + 0.000008, 0.000009}]},
  MaxRecursion → 1000, PlotPoints → {200 000, 100 000},
  AspectRatio → 1,
  AxesOrigin → {0, 0},
  RotateLabel → True,
  LabelStyle → {21, GrayLevel[0]},
  FrameTicks → {{{#, ScientificForm@#} & /@
  {0, 0.000002, 0.000004, 0.000006, 0.000008, 0.00001}, None},
  {{#, ScientificForm@#} & /@ {0, 0.00005, 0.000125}, None}},
  LabelStyle → {21, GrayLevel[0]}, ImageSize → {450, 450},
  AspectRatio → Full, PlotLabel → None]

```

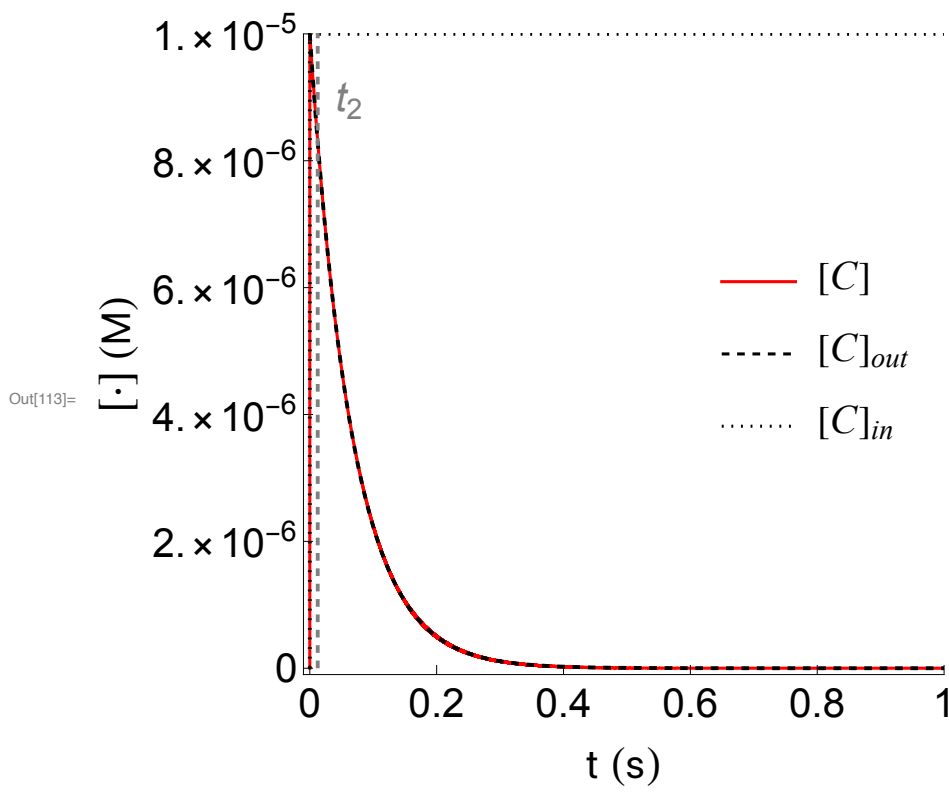
(*****)



```

In[108]:= tend = 1;
Sol1 = NDSolve[{D[s[t], t] == -k1 * e[t] * s[t] + k0 * c[t],
  D[e[t], t] == -k1 * e[t] * s[t] + (k0 + k2) * c[t],
  D[c[t], t] == k1 * e[t] * s[t] - (k0 + k2) * c[t], D[p[t], t] == k2 * c[t],
  s[0] == s0, e[0] == e0, c[0] == c0, p[0] == p0}, {s, e, c, p}, {t, 0, tend}];
Plot31 = Plot[Evaluate[c[t] /. First[Sol1]], {t, 0, tend}, MaxRecursion -> 15,
  PlotPoints -> {200 000, 100 000}, Mesh -> False, AxesLabel -> {t, c},
  PlotRange -> {{-0.01, tend}, {-10^(-7), 0.00001}}, PlotStyle -> Red,
  FrameLabel -> {Style["t (s)", FontFamily -> "MS Serif", FontSize -> 21],
  Style["[.] (M)", FontFamily -> "MS Serif", FontSize -> 21]},
  RotateLabel -> True, Frame -> {{Automatic, False}, {Automatic, False}}];
Pcex = Plot[l * A1 * Exp[-k2 * t], {t, 0, tend}, PlotPoints -> 4000, Mesh -> False,
  AxesLabel -> {t, ce}, PlotRange -> {{-0.01, tend}, {-10^(-7), 0.00001}},
  PlotStyle -> {Thick, Dashed, Black},
  FrameLabel -> {Style["t (s)", FontFamily -> "MS Serif", FontSize -> 21],
  Style["[.] (M)", FontFamily -> "MS Serif", FontSize -> 21]},
  RotateLabel -> True, Frame -> {{Automatic, False}, {Automatic, False}}];
Pcin = Plot[c0 + s0 * (1 - Exp[-k1 * A2 * t]), {t, 0, tend},
  PlotPoints -> 4000, Mesh -> False, AxesLabel -> {t, ci}, PlotRange ->
  {{-0.01, tend}, {-10^(-7), 0.00001}}, PlotStyle -> {Thick, Dotted, Black},
  FrameLabel -> {Style["t (s)", FontFamily -> "MS Serif", FontSize -> 21],
  Style["[.] (M)", FontFamily -> "MS Serif", FontSize -> 21]},
  RotateLabel -> True, Frame -> {{Automatic, False}, {Automatic, False}}];
Show[Plot31, Pcex, Pcin,
  ParametricPlot[{t2, u}, {u, 0, 0.0000105}, PlotStyle -> {Gray, Dashed, Thick}],
  PlotRange -> {{-0.01, tend}, {-10^(-7), 0.00001}},
  PlotRange -> {{0, tend}, {0, 0.00001}},
  Epilog -> {Inset[Column[{LineLegend[{Red, {Black, Dashed}, {Black, Dotted}],
  {"[C]", "[C]_out", "[C]_in"}, LabelStyle -> {FontFamily -> "Times New Roman",
  FontSize -> 21, FontSlant -> Italic}}], Scaled[{0.8, 0.5}]],
  Inset[Graphics[{Gray, Text[Style["t2", 21]}], {t2 + 0.05, 0.000009}]],
  MaxRecursion -> 1000, PlotPoints -> {200 000, 100 000},
  AspectRatio -> 1, AxesOrigin -> {0, 0},
  RotateLabel -> True,
  LabelStyle -> {21, GrayLevel[0]},
  FrameTicks -> {{{#, ScientificForm@#} & /@ {0, 0.000002, 0.000004, 0.000006,
  0.000008, 0.00001}, None}, {{0, 0.2, 0.4, 0.6, 0.8, 1}, None}},
  LabelStyle -> {21, GrayLevel[0]}, ImageSize -> {450, 450},
  AspectRatio -> Full, PlotLabel -> None]

```



```
In[114]:= Pcu = Plot[c0 * Exp[-k2 * t] + s0 * (Exp[-k2 * t] - Exp[-k1 * A2 * t]),
  {t, 0, tend}, PlotPoints → 4000, Mesh → False, AxesLabel → {t, cu},
  PlotRange → {{0, tend}, {-10^(-7), 0.00001}}, PlotStyle → {Black, DotDashed},
  FrameLabel → {Style["t (s)", FontFamily → "MS Serif", FontSize → 21],
  Style["[.] (M)", FontFamily → "MS Serif", FontSize → 21]},
  RotateLabel → True, Frame → {{Automatic, False}, {Automatic, False}}];
```

```
Show[Plot31, Pcu,
  ParametricPlot[{t2, u}, {u, 0, 0.0000105}, PlotStyle → {Gray, Dashed, Thick}],
  PlotRange → {{-0.01, tend}, {-10^(-7), 0.00001}},
  PlotRange → {{0, tend}, {0, 0.00001}},
  Epilog → {Inset[Column[{LineLegend[{Red, {Black, DotDashed}},
    {"[C]", "[C]un"}], LabelStyle → {FontFamily → "Times New Roman",
    FontSize → 21, FontSlant → Italic}]], Scaled[{0.8, 0.5}]],
    Inset[Graphics[{Gray, Text[Style["t2", 21]]}], {t2 + 0.05, 0.000009}]},
  MaxRecursion → 1000, PlotPoints → {200 000, 100 000},
  AspectRatio → 1, AxesOrigin → {0, 0},
  RotateLabel → True,
  LabelStyle → {21, GrayLevel[0]},
  FrameTicks → {{{#, ScientificForm[#] & /@ {0, 0.000002, 0.000004, 0.000006,
    0.000008, 0.00001}, None}, {{0, 0.2, 0.4, 0.6, 0.8, 1}, None}},
  LabelStyle → {21, GrayLevel[0]}, ImageSize → {450, 450},
  AspectRatio → Full, PlotLabel → None]
```

